MapTool Version 2

User's Manual

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Abstract

MapTool is an interactive computer program for the display of common marine geophysical data. At present, the program displays isolines, color-filled contours, navigation tracklines, and navigated scalar values in a variety of styles. A variety of map projections are supported. This document describes the basic requirements for running the *MapTool* program, for creating various displays, and generating hard copy output. The supported data file formats are described. All of the options, displays, menus, and windows are documented.

Acknowledgments

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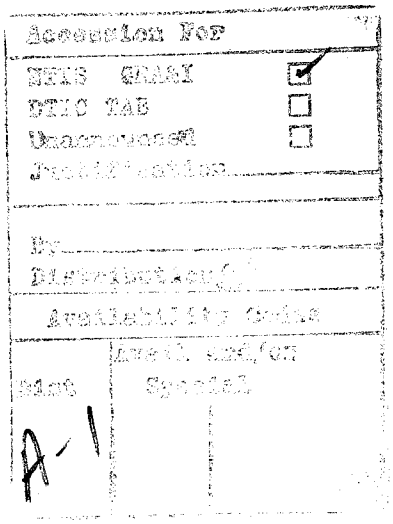

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Section 1 — Introduction

MapTool is an interactive, workstation based computer program for displaying some common marine geophysical data. It uses the OpenLook™ and XView™ toolkits for its graphical user interface, and the Uniras agX/Toolmaster™ as its graphical programming interface. It operates in an X11 environment for interactive use, and supports a variety of hard copy devices.

A few of the features of the *MapTool* program include:

- Interactive display of contour isolines, with optional color-fill between isolines. Also supports missing data, and filtering interpolated data.
- Display of navigation tracklines, with full control of annotations, tickmarks, label orientation, and color.
- Supports the "Drag-and-Drop" metaphor for importing data files from the OpenWindows File Manager.
- Produces PostScript, rasterfile, and metafile hardcopy outputs.
- Displays scalar values in a variety of styles, including actual value, wiggle-style, scaled symbols, and value filtering.
- Supports a variety of map projections and ellipsoids.
- Interactive range and bearing measurements.

The purpose of this document is to provide basic information about running the *MapTool* program, importing data, creating a map display, and generating hard copy output. This document explains all of the options, displays, menus, windows, necessary and optional features, system requirements, and data file formats. Examples of windows, files, and outputs are given.

The development of the *MapTool* software has been done under the auspices of the WHOI Digital Image Analysis Laboratory (DIAL). The DIAL facility has been established within the Geology and Geophysics Department in order to establish and centralize capabilities for the processing, display, and archiving of a wide variety of large-volume, marine geological and geophysical digital data sets.

1.1 System Requirements

The *MapTool* program requires the use of an interactive, X11-based, Unix workstation. The following are the characteristics of a *MapTool* compatible system:

- SunOS Version 4.1.3, or Solaris 2.2 or higher.
- OpenWindows Version 3
- XView Version 3

- 8-bit Color display
- 24 MB of system memory. Additional memory will be needed for anything more than a simple chart display.
- Uniras agX/Toolmaster run-time support, Version oV3B.

As an X11-based program, *MapTool* can also operate as a client program on a remote host, with the local server managing the display, mouse, and keyboard. This is accomplished by setting the `DISPLAY` environmental variable on the client host, and authorizing remote access on the server host. Consult the appropriate X11 and OpenWindows documentation for further details concerning the configuration of an appropriate client-server relationship.

1.2 Document Conventions

This document uses typographical methods to denote various components of the *MapTool* program:

- Words, phrases, and titles taken directly from *MapTool* windows are displayed in a fixed-width, sans-serif font. For example, the title of the main window of the *MapTool* program is shown as "MapTool: Version x.x".

- Interactive, command-line based dialogues are also shown using a mono-spaced, typewriter font. When appropriate in such dialogues, user responses will be highlighted in bold. For example, in the following dialogue (*not* part of the *MapTool* program), the user types the word "date" followed by [RETURN], and the operating system responds by displaying the current date and time:

```
% date
Thu Feb 3 15:55:15 EST 1994
%
```

- Special key sequences are denoted by enclosing in square brackets, and using small capital letters. A fixed-width, sans-serif font is also used. For example, the sequence [RETURN] refers to pressing the key labelled "Return." The sequence [SELECT] refers to pressing the "Select" button on the mouse or pointing device. When more than one key or button need to be pressed simultaneously, then the entire sequence is enclosed in square brackets, with individual sequences separated by the "/" character. For example, the sequence [SHIFT/SELECT] refers to simultaneously pressing the "Shift" key on the keyboard and the "Select" button on the mouse.

Section 2 — Setup and Start-up

Prior to using *MapTool*, it is necessary to configure the Unix user environment. This will typically take the form of adding statements to a user's `.cshrc` and `.Xdefaults` files. In addition, it may be necessary to gain access to file systems containing the *MapTool* software. This section will provide information for a common configuration.

On-line copies of these setup file modifications can be found in the file `$DIALHOME/samples/dial_setup`. Other files (sample data files, attribute files, and so forth) can also be found in the same directory.

2.1 File System Access

If the *MapTool* software is not available on a locally mounted file system, it will be necessary to remotely mount from another host. The preferred method is to use the `automount` facility provided with SunOS. This service automatically and transparently mounts an NFS file system as needed. The configuration and operation of the automounter and NFS is well beyond the scope of this user manual. If needed, consult the system administrator for your local host system.

In a simple case, where the local host is running Sun OS 4.1.x, with a single automount file, the following sequence can be used (must be the root user):

1. Add an entry into the automount file (typically `/etc/auto.mount`):

```
/home/Dial    -ro    tone:/files/tone/Dial
```

2. If the automount daemon is currently running, kill it. Note that one must send a `SIGTERM` signal (via `kill -15`) to properly terminate the automount daemon.

3. Restart the automount daemon. Under SunOS 4.1.x, the automount daemon is usually started from the file `/etc/rc.local`. Look in this file to see the proper way to initiate.

In this example, the remote host `tone` contains the necessary *MapTool* program files, which are then locally mounted to the file system `/home/Dial`. In cases where either Yellow Pages or NIS systems are in effect, different procedures will be required. Again, consult the system administrator for your local host system for implementation details.

2.2 User Environment

Prior to starting *MapTool*, it is necessary to set up the user environment. Since this procedure must be followed every time a user logs into the system, it is common to place these commands in a user's .cshrc file. A typical entry would consist of the following:

```
[illegible]
```

In addition, in order to properly interact with the X11 server on the local display host, each user should add the following entries to the file $HOME/.Xdefaults:

```
[illegible]
```

Note again that these initialization settings are samples only — your local configuration may be different. After making these changes to .cshrc and .Xdefaults, it is best to log out, then log back in to make sure the changes are set properly within the X Window Manager.

2.3 Running *MapTool*

Provided a proper environment has been initialized, starting the *MapTool* program is best done by running the program in the background. There are at least two ways to do this. First,

from the Unix C-shell command line, type:

```
% MapTool [-f mapfilename] &
```

Note the option *-f mapfilename* parameter on the command line. This allows for the initial loading of a saved map file prior to display. Refer to Section 5.1.1 for how to create a map file. If no map file is given, then the default parameters are used.

A second method of starting the *MapTool* program is to add an entry into the file `$HOME/.openwin-menu`, which will start the program when invoked from the OpenWindows Workspace Menu. A typical entry in `$HOME/.openwin-menu` would look something like:

```
"MapTool..."          exec $DIALHOME/bin/MapTool
```

Note that *MapTool* supports the standard XView command line start-up options. For example, use the option "`-Wi`" to start *MapTool* as a closed Icon. See the appropriate XView and OpenWindows documentation for additional start-up options.

Section 3 — *MapTool* Display

The *MapTool* program is an interactive, workstation-based program. As such, all user interaction is done through display windows. This section describes the main map display. Subsequent sections describe the various pop-up windows, menus, and buttons.

3.1 Map Display

The main display (or base) window of the *MapTool* program is a two-dimensional map, somewhat analogous to a sheet of paper. Various sized "sheets of paper" (or screens) can be selected for drawing a map (see Section 5.4.1, Program Properties); in all cases, the map that is displayed will fit the largest map possible while preserving the proper aspect ratio. The drawing "tools" used to make the map are fixed in size, such that a thin line drawn on a small screen will be the same width on a large screen. Regardless of the state of the *MapTool* program, a map is always defined. In most cases, the map will have borders, labels, and data displayed inside. However, a map can also be defined with no borders or labels, and without data being displayed. A map then is defined as simply a view of a specific geographic area. All of the elements of how that area is to be viewed are user-options, but an area is always defined.

When the *MapTool* program is first started, the base window "`MapTool - Version 2.1`" is displayed. Note that this is a sample display — the display a user will see will depend on default values selected.

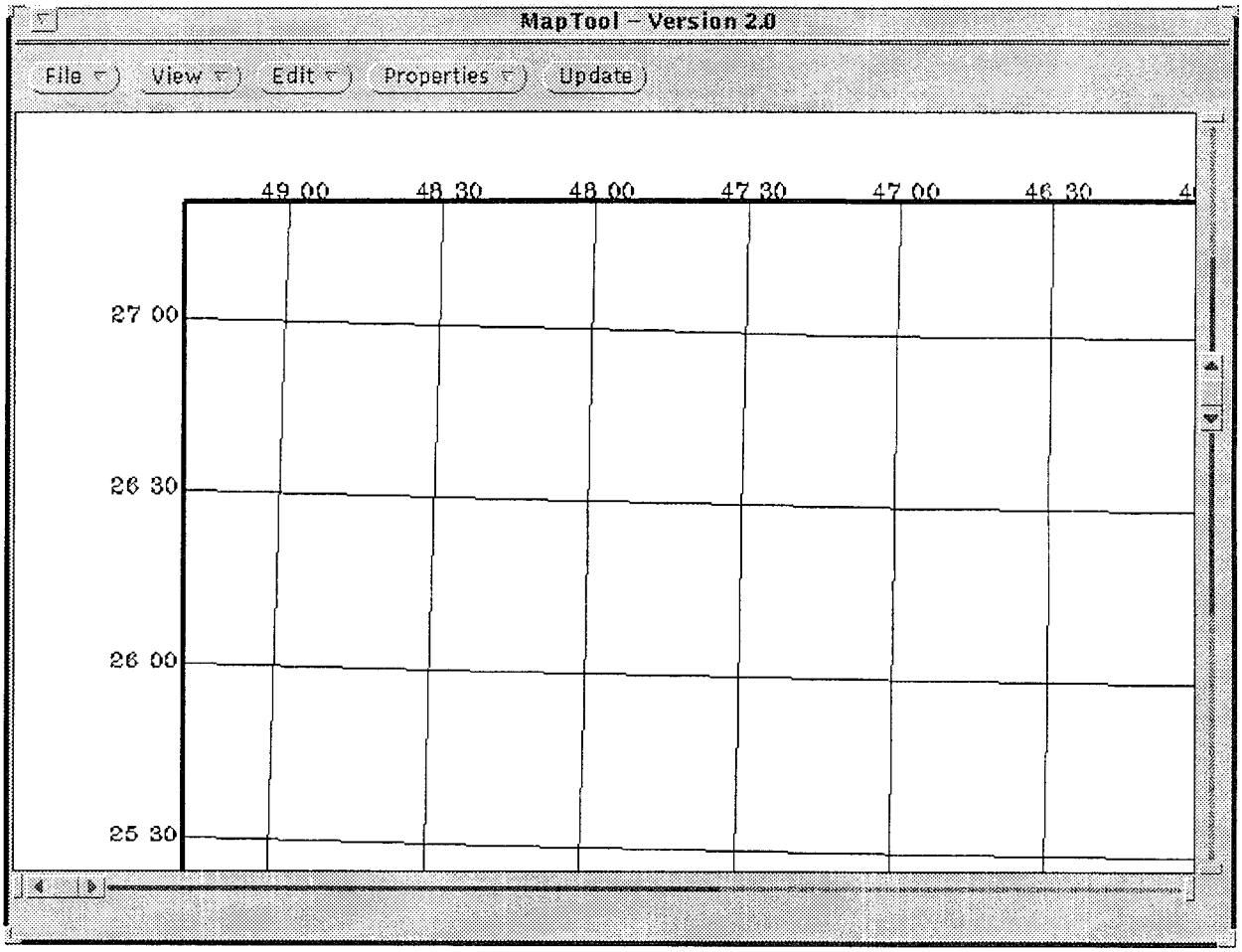


Figure 3-1. *MapTool* Base Window

3.2 Scroll Bars

Since the size of the map area may exceed a user's physical screen or size of the base window, both horizontal and vertical scroll bars are provided to view a portion of the map area. When the `Screen Size` attribute is set to `Full Screen` (see Section 5.4.1), then the scroll bars are only needed if the base window is sized less than the full screen. When `Screen Size` is set to `2X Full Screen` or `4X Full Screen`, then the scroll bars are need to view the entire map area.

3.3 Base Window Footers

Both the left and right window footer locations are used to display various information messages to the user. These messages will be described in the sections where the messages are

generated. Note also that many of the pop-up windows will also contain important information in their window footers.

3.4 [UPDATE] Button

During a typical interactive *MapTool* session, the user may import a variety of files, and then change each file's display characteristics until the desired map is drawn. The purpose of the [UPDATE] button is to redraw the current map, so that changes to data or display characteristics are shown. If the display currently shown matches all of the user settings, then the [UPDATE] button will be disabled. When the setting "Program Properties: Display Update" is set to Automatic (see Section 5.4.1), then the map display will be updated whenever necessary, and the [UPDATE] button will not be available.

Selecting the Redraw menu item from the base window frame pop-up menu will also cause the map area to be totally redrawn.

3.5 Drag-and-Drop

Two methods are available for importing data into the *MapTool* program. One method is through the use of the File: Import... menu item described in Section 5.1.4. Additionally, supported data files may be "dropped" on to the map area from programs that support "dragging" of files to selected targets. For example, the OpenWindows File Manager allows "dragging" of files to other programs. To use, use the [SELECT] button on the mouse to first select a file in the File Manager window, then, holding down the [SELECT] button, "drag" the file until its icon representation is on top of the *MapTool* map area. Release the [SELECT] button and the file will be loaded.

Section 4 — Mouse and Keyboard Commands

Control of the *MapTool* program is accomplished primarily through the use of the mouse and keyboard. The mouse, in conjunction with mouse buttons, is used to interact with the main display and control pop-up windows. Options are selected by clicking the mouse in check boxes and other control elements. The keyboard is used to enter values and file names into entry fields.

4.1 Mouse Tracking

While the *MapTool* program is running, the location of the mouse pointer is continuously tracked and converted to map coordinates. The default tracking action is to display the geodetic coordinates (latitude and longitude) of the tip of the mouse pointer in the left window footer. As the mouse is moved, these values will be automatically updated. If the [SHIFT] key is pressed during mouse tracking, then the projected, cartesian coordinates (X & Y) will be shown in the footer. When [SHIFT] is released, geodetic coordinates will be shown.

Note that the mouse tracking, coordinate display only occurs while the mouse pointer is *inside* the current map area.

4.2 [SELECT] Actions

While the mouse point is inside the current map area, pressing the [SELECT] button on the mouse (normally MB1, the "left" button) allows a user to measure the distance between two points. This procedure is accomplished by:

1. Move the mouse pointer to the location of the starting point of the line to be measured. Use the mouse tracking feature (see Section 4.1) to precisely locate the pointer position in geodetic coordinates.
2. Press and hold ("drag") the [Select] button. A line will be drawn from the start point to the current point. The endpoints of the line will be displayed in the left window footer. The range and bearing from the first point to the endpoint will be displayed in the right window footer.
3. Release the [Select] button. The pointer returns to normal shape, the line disappears, and the left window footer returns to coordinate tracking.

Note that the line to be measured must be *inside* of the current map area.

4.3 [ADJUST] Actions

While the mouse pointer is inside the current map area, pressing the [Adjust] button on the mouse (normally MB2, the "middle" button) allows a user to "zoom in" to the map area by interactively determining a new set of map chart boundaries. This procedure is accomplished by:

1. Move the mouse pointer to the location of one corner of the new area. Use the mouse tracking feature (see Section 4.1) to precisely locate the pointer position in geodetic coordinates.
2. Press and hold ("drag") the [Adjust] button. A box will appear showing the new chart boundaries, and will move as the mouse is moved. The geodetic corners of the box will be displayed in the left window footer. A small circle will appear at the tip of the mouse pointer, indicating a "drag" operation.
3. While dragging the mouse, press the [Esc] key at anytime to cancel the zoom in operation.
4. When the desired opposite corner of the chart box is displayed, release the [Adjust] button. The chart boundary properties will be updated.

Note that it is not possible to extend the "zoom-in" operation to a point outside of the current map area. Instead, use a "zoom-out," followed by a "zoom-in."

4.4 [MENU] Actions

While the pointer is inside the current map area, pressing the [Menu] button on the mouse (normally MB3, the "right" button) activates the "Zoom Out" pop-up menu. The purpose of this menu is to expand the chart boundaries of the current map, while keeping the same map aspect ratio and center of the map. When invoked, five possible menu items are available:

`10 Percent`	Both the latitude and longitude spans are increased by ten percent. The increase is distributed equally between the minimum and maximum geodetic values.
`33 Percent`	Both the latitude and longitude spans are increase by 33 percent, equally distributed between minimum and maximum values.
`100 Percent`	Both spans are increased by 100 percent, equally distributed.
`300 Percent`	Both spans are increased by 300 percent, equally distributed.
`Auto-Locate Data`	When selected, the bounds of all the data currently in use is determined and the chart boundaries are adjusted so that all data will be visible.

If the attribute `Program Properties: Display Update` (see Section 5.4.1) is set to `Manual`, then the map area will be updated the next time the map is re-displayed. If set to `Automatic`, then the map area is updated immediately.

Section 5 — Menus

This section describes the pull-down and pop-up menus in the MapTool program. It is assumed that the user is familiar with the mouse actions necessary to manipulate menus. All of the menus described are part of the main *MapTool* display window (see Section 3.1).

5.1 File Menu

The `File` menu is a menu button that contains actions that deal with the input and output of files. These files may relate to data, program properties, or printing.

5.1.1 Load...

The `Load...` menu item is used to load a previously saved map-file into the *MapTool* program. A map-file contains a complete list of all display parameters and options, along with a list of all the data files used. When selected, the "`MapTool: Load File:`" pop-up window appears if not already visible:

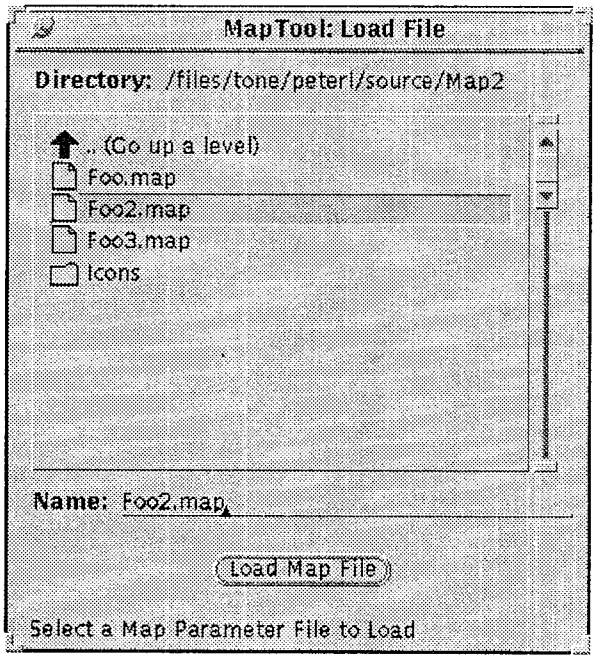


Figure 5-1. *MapTool* Load File Pop-up Window

Use the mouse and keyboard to select a map file to load. Only those files which have been created using the MapTool File: Save... function (See Section 5.1.2) will be displayed. In addition, one can directly type in a filename to be loaded.

5.1.2 Save...

The Save... menu item is used to save all of the parameters, options, and file names used to create the current map in a file for use at a later time. These files can be loaded either when starting the MapTool program (See Section 2.3) or by invoking the MapTool File: Load... menu item (see Section 5.1.1). When invoked, the "MapTool: Save File" pop-up window appears:

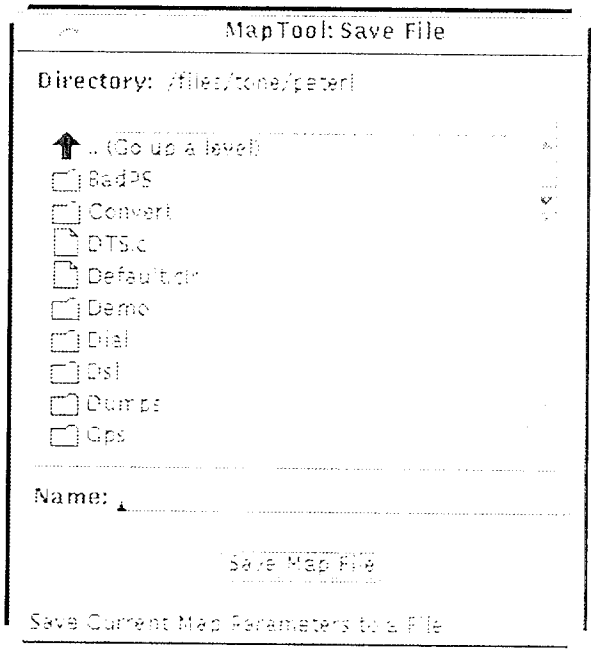


Figure 5-2. *MapTool* Save File Pop-up Window

Use the mouse and keyboard to enter the name of a file in the displayed directory to store the map information. All files (not just previously saved files) are shown.

5.1.3 New

The New menu item is used to reinstate the *MapTool* display to its initial state. When selected, the following actions are taken:

- All data files that have been imported are removed.
- All of the display properties are reset to the values used at program startup.
- The map display is cleared, and an update event is generated.

If any data files are open for writing or have been modified, then user confirmation will be required.

5.1.4 Import...

The `Import...` menu item is used to import data files into the MapTool program. When selected, the "`MapTool:Data Chooser`" pop-up window appears if not already visible:

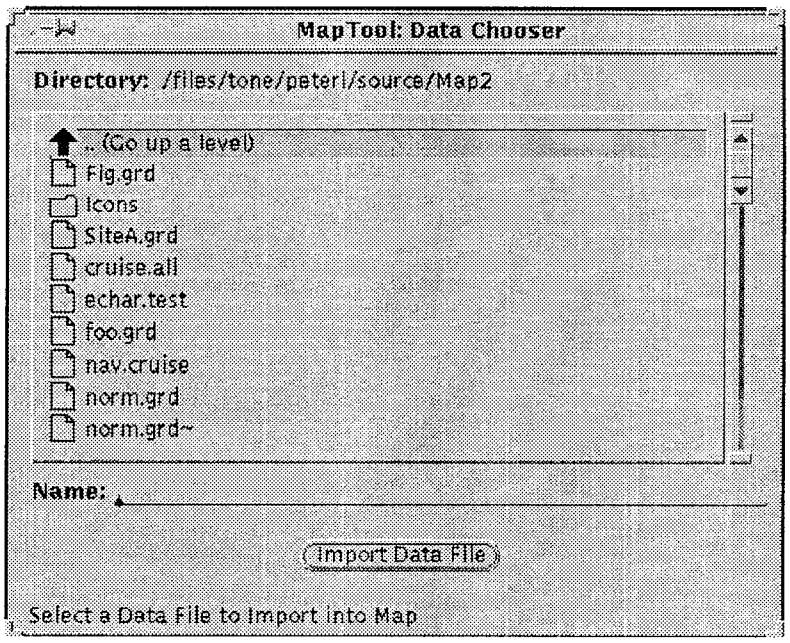


Figure 5-3. *MapTool* Data Chooser

Data files to be imported are selected by navigating the `Data Chooser`, via the mouse and keyboard commands. Two notes about the `Data Chooser`:

- Only valid data files (See Section 6) are shown in the `Data Chooser` scrolling list, along with the sub-directories of the current directory. However, the user may type the name of a data file directly into the `Name:` field if the desired data file is not present in the scrolling list.
- The `Data Chooser` does not always recognize NFS automounted file systems automatically. To access these file systems, it may be necessary to type the name of the file system directly into the `Name:` field, then either type [`RETURN`] or use the mouse to

[SELECT] the [IMPORT DATA FILE] button.

Once the desired file is selected, either double-click on the file name, or use the mouse to [SELECT] the [IMPORT DATA FILE] button. Once selected, the MapTool program will attempt to read data from the desired file. If successful, the file will become available for display depending on its type.

In addition to using the Data Manager, the *MapTool* program supports the Drag and Drop metaphor for importing data files. See Section 3.5.

5.1.5 Export...

The Export... menu item is not available.

5.1.6 Print

The Print . . . menu item is used to select the output format for generation of hardcopy products. For a complete description, see Section 7, Hardcopy Output.

5.1.7 Quit

The Quit menu item is used to terminate the *MapTool* program. If there are any data files open for writing or that have been changed prior to saving, then user confirmation will be needed to exit the program. In addition to the Quit menu item, the *MapTool* program can be terminated by selecting Quit from the base window pop-up as provided by the OpenWindows Window Manager.

5.2 View Menu

The View Menu contains menu items for viewing various information about the current map.

5.2.1 Data Summary...

The Data Summary... menu item is used to review and manage the data files currently used for the *MapTool* display. When selected, the "MapTool: Data Summary" pop-up window appears.

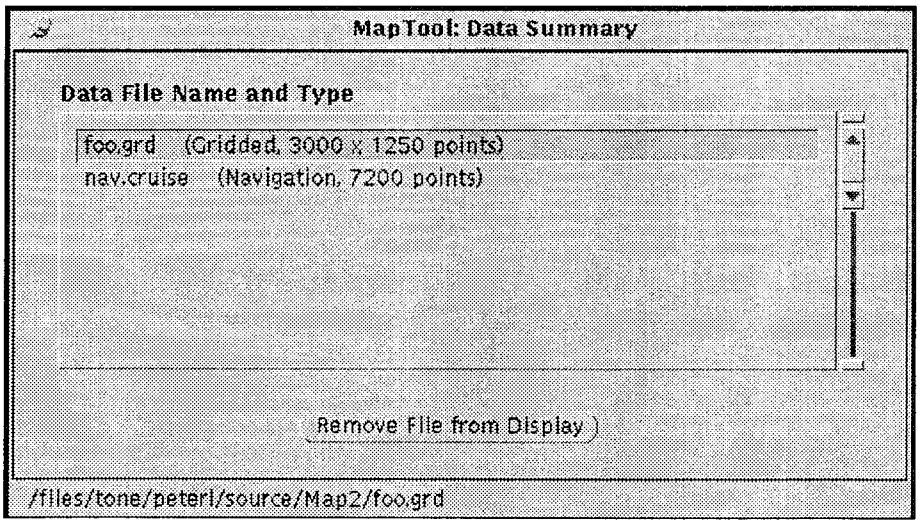


Figure 5-4. *MapTool* Data Summary

For each data file currently in use, the following information is given:

- The name of the file. When a file is selected from the list, the entire path and file name is displayed in the left window footer.
- The type of the data, as described by attributes.
- An indication of the size of the file. For gridded data, the number of rows and columns is shown. For navigation and alongtrack data, the number of data points is shown.

A data file will be added to this list whenever a file is successfully loaded into the *MapTool* program, either by the `File:Import...` menu (see Section 5.1.4) , or by a drag-and-drop operation (see Section 3.5). To remove a file from the list, and hence remove from the *MapTool* display, first select the file by using the [SELECT] button on the mouse, then the [REMOVE FILE FROM DISPLAY] button.

5.2.2 Display Summary...

The `Display Summary...` menu item is not available.

5.2.3 Contour Legend...

The `Contour Legend...` menu item is used to view how colors are associate with gridded data values displayed as either images or color-filled contours (see Section 5.4.5.3). When

invoked, the "MapTool: Color Scale" pop-up window is made visible:

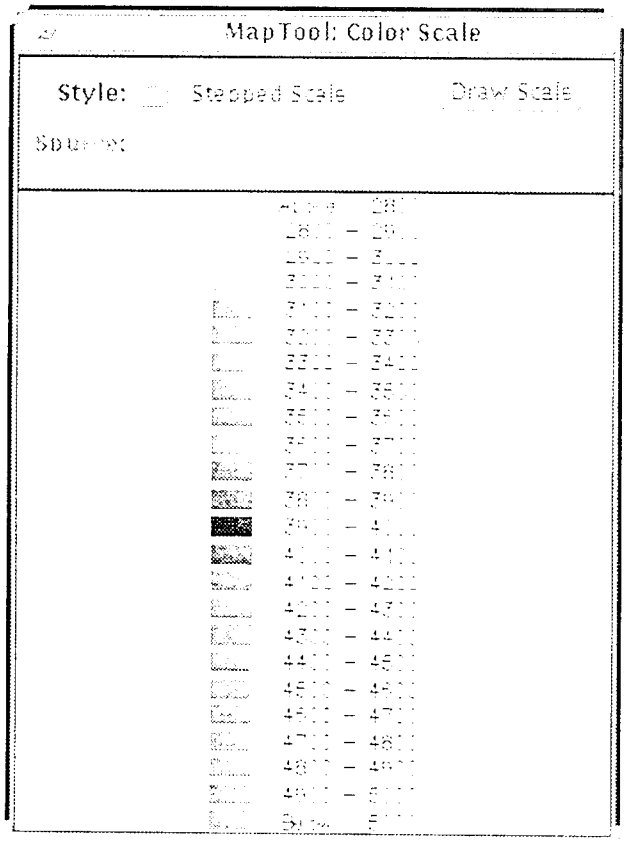


Figure 5-5. *MapTool* Color Scale

Unlike other displays, the "MapTool: Color Scale" pop-up does *not* automatically update as new color scales are produced. In order to see the latest color scales, the user must select the [DRAW SCALE] button. The pop-up window can be resized by dragging on the corners. The available options for this window are:

Style:	Selects the style of contour legend to be displayed. Note that this setting will also determine the style of the legend drawn in hardcopy outputs. Available styles are:
Stepped Scale	This style of legend shows color as discrete boxes, labelled with the range of values corresponding to each color.
Continuous Scale	This style of legend show a smooth, continuous band of colors. Points corresponding to actual values are labelled on the left side of the legend.

If no color scale information is in use, then the [DRAW SCALE] button will be disabled.

5.3 Edit Menu

The `Edit...` menu is not available.

5.4 Properties Menu

The `Properties Menu` is a menu button containing items that relate to how *MapTool* will display map data. Groups of properties are collected under various categories.

5.4.1 Program...

The `Program...` menu item is used to set some general properties of how the *MapTool* program will operate, and as a collection point for properties that do not easily fit into other categories. When invoked, the "`MapTool: Program Properties`" pop-up window will be displayed:

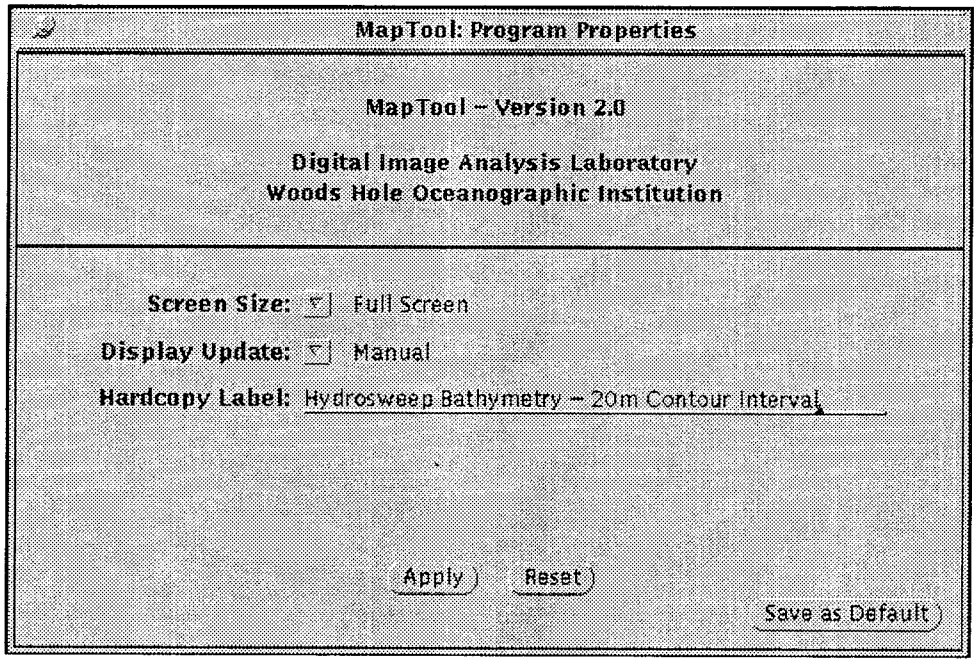


Figure 5-6. *MapTool* Program Properties

The following options are available:

Screen Size: Affects the size of the map that will be displayed on the screen. Possible selections are:

Full Screen: The entire screen is used. When the Map Window is fully expanded, the entire map should be visible.

2X Full Screen: An area that is twice as wide and twice as high as the screen is used. The entire map will *never* be visible, but can be viewed by using the scroll bars.

4X Full Screen: An area four times the width and height of the screen is used for the map. Use scroll bars to view portions of the map.

Display Updates: Controls when the map screen is updated. Updates are needed when data is loaded or removed, or when display properties are changed. Possible selections are:

Manual: When Manual is selected, display updates occur when either the [Update] button is selected (see Section 3.3), or when the entire window is refreshed.

Automatic: When Automatic is selected, display updates occur whenever events trigger them. For example, importing a new data file will cause an update.

Hardcopy Label: The user may enter a character string that will be printed along the bottom edge of a map when generating hardcopy.

[Apply] Button: Selecting this button causes those values chosen to be used for subsequent operation.

[Revert] Button: Selecting this button causes any value modified to be set back to its unmodified state.

[Save as Default] Button: Selecting this button causes the values currently in use to be saved in a user initialization file, and will be loaded the next time the *MapTool* program is started, or when a New map is selected.

5.4.2 Selection...

The Selection... menu item can be used to edit the display properties of whichever data file is selected from the "MapTool: Data Summary" pop-up window (See Section 5.2.1). When selected, the appropriate pop-up window for the particular data type is displayed, showing the

display attributes for the selected data file. If no data file is currently selected, then the `Selection...` menu item is not available.

5.4.3 Chart...

The `Chart...` properties menu item is used to select properties that control the chart area of the map. This information includes the location of the map, the map projection used, and the map scale for certain types of hardcopy. When `Chart...` is selected, the "`MapTool: Chart Properties`" pop-up window is displayed:

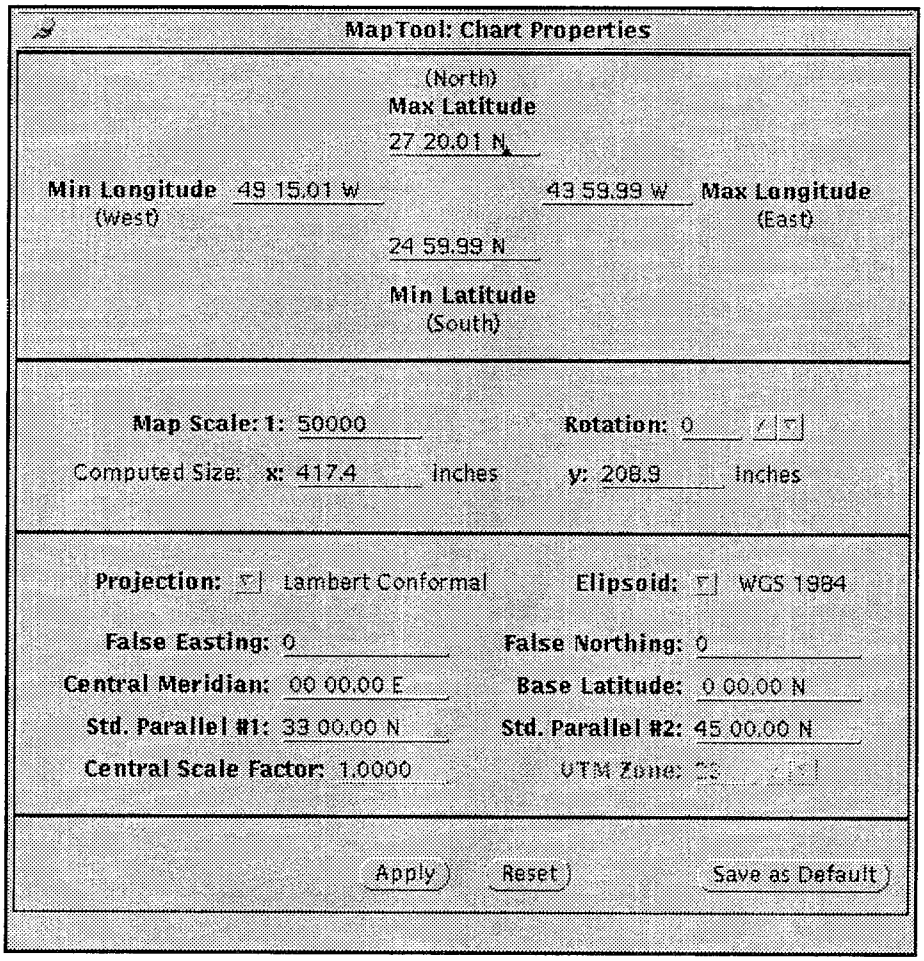


Figure 5-7. *MapTool* Chart Properties

The following settings are available:

`Max Latitude (North):` Geodetic coordinate for the maximum latitude value in the map area. This will be the "Northern"

border of the map area. Note that the map may actually contain points greater than this value, depending on the map projection and rotation. Enter values as either (1) decimal degrees, (2) whole degrees and decimal minutes, or (3) whole degrees and minutes and decimal seconds. Indicate the desired hemisphere with either a "N" or "S", or use a positive value for the Northern hemisphere or a negative value for the Southern hemisphere.

`Min Longitude (West):` Geodetic coordinate for the minimum longitude value in the map area. This will be the "Western" border of the map area. Depending on projection and rotation, map may contain points less than this value. Indicate the hemisphere with either a "W" or "E", or use a positive value for the Eastern hemisphere or negative for the Western hemisphere.

`Max Longitude (East):` Geodetic coordinate for the maximum longitude value in the map area. This will be the "Eastern" border. Points displayed will depend on projection and rotation. Must include hemisphere designation.

`Min Latitude (South):` Geodetic coordinate for the minimum latitude value in the map area. This will be the "Southern" border.

`Map Scale:` The natural scale to be used for the map, *only* when generating certain hard copy outputs.

`Rotation:` The number of degrees of rotation for the projected map coordinates, measured clockwise from true North. Valid values range from -45 to 45 degrees. Note that, at present, gridded data *cannot* be displayed on rotated maps.

`Computed Size (x & y):` These fields display the computed size of the map area selected using the `Map Scale` value displayed. These values do not include labels, legends, and so forth, that fall "outside" the map area.

`Projection:` The type of map projection to be used. When a particular projection is selected, corresponding projection parameters will become enabled or disabled as needed. Possible projection values are:

- `Mercator` A cylindrical, conformal projection.
- `UTM` The Universal Transverse Mercator projection is a special case of a Transverse Mercator projection.
- `Transverse Mercator` A transverse cylindrical, conformal projection.

Lambert Conformal	A conic, conformal projection.
Azimuthal Stereographic	An azimuthal, conformal projection.
Ellipsoid:	Describes the shape and size of the ellipsoid used in the selected map projection, by setting the Equatorial (a) and Polar (b) radius of the Earth. Possible values are:
Sphere	a = 6,371,000.0 m, b = 6,371,000.0 m. A spherical earth.
WGS 1984	a = 6,378,137.0 m, b = 6,356,752.3 m.World Geodetic System of 1984. Within accuracy of MapTool program, same as Geodetic Reference System (GRS) of 1980.
WGS 1972	a = 6,378,135 m, b = 6,356,750.5 m. World Geodetic System of 1972.
Int'l 1924	a = 6,378,388.0 m, b = 6356911.9 m. International Union of Geodesy and Geophysics of 1924. Also known as Hayford ellipsoid. .
Clarke 1880	a = 6,378,249.1 m. b = 6,356,514.9 m.
Clarke 1866	a = 6,378,206.4 m. b = 6,356,583.8 m.
False Easting:	
False Northing:	
Central Meridian:	
Base Latitude:	*See Appendix A, Map Projections, for a complete description of these parameters.*
Std. Parallel #1:	
Std Parallel #2:	
Central Scale Factor:	
UTM Zone:	
[APPLY] Button	Selecting this button applies the values currently being displayed to the map area. Geodetic values will be reformatted into whole degrees with decimal minutes.
[RESET] Button	Selecting this button resets the fields in this display to the value currently in use.
[SAVE AS DEFAULT] Button	Selecting this button saves the values currently in use to a user initialization file. This file will be read the next time the *MapTool* program is started, or when a New map is selected.

5.4.4 Graticule...

The Graticule... properties menu item is used to select properties that control the graticule elements of the map. Graticule elements refer to the graphical elements that annotate a chart. For example, the series of latitude and longitude reference lines inside the chart are graticule elements. When Graticule... is selected, the "MapTool: Bar Border Properties" pop-up window is displayed:

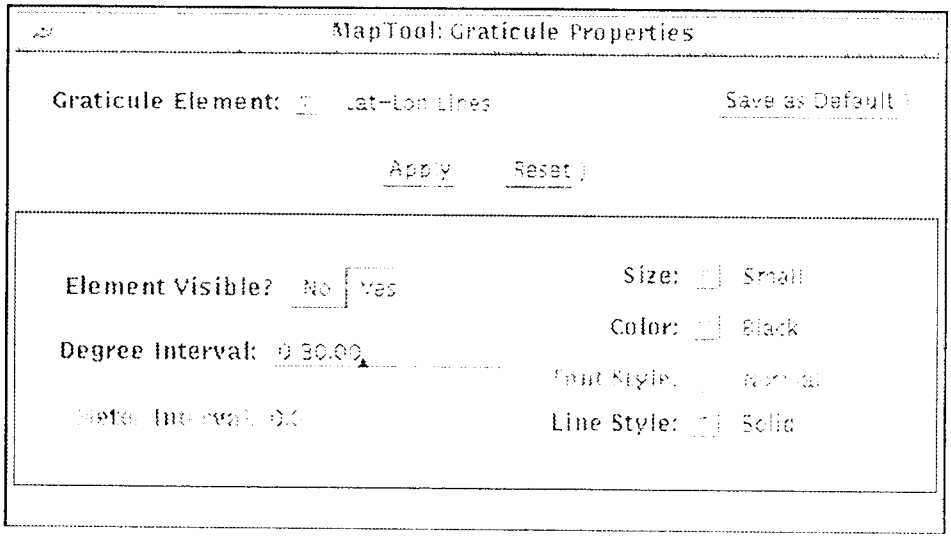


Figure 5-8. *MapTool* Graticule Properties

The "MapTool: Graticule Properties" pop-up window is organized into two panels. The upper panel is used to select, from a menu list, which graticule element to modify. The lower panel shows various element attributes — only those attributes that are needed for a particular element are enabled. For example, when the graticule element Lat-Lon Lines is selected, the attribute Font Style is disabled.

The following are available graticule elements:

Bounding Box:	A border rectangle that encompasses the map area. All map drawing of data is done inside the bounding box.
Meter Lines:	A series of lines corresponding to projected meters in cartesian coordinates for the map area. Lines are drawn in both the X and Y direction.
Meter Label:	Labels corresponding to projected meters in cartesian coordinates for the map area. Labels are drawn where meter lines would intersect the map border, on the inside of the map area.

Meter Markers:	Markers (plus sign) drawn at the intersection of lines corresponding to projected meters in cartesian coordinates for the map area.
Lat-Lon Lines:	A series of lines corresponding to geodetic coordinates for the map area. Lines are drawn at both constant latitude and longitude.
Lat-Lon Labels:	Labels corresponding to geodetic coordinates for the map area. Labels are drawn where the lat-lon lines would intersect the map border, on the outside of the map area.
Lat-Lon Ticks:	Short lines drawn where lat-lon lines would intersect the map border, on the inside of the map area.

Like many other property pop-up windows, the following buttons are available to modify parameters:

[APPLY] Button	When selected, values currently being displayed in entry fields become the current values for the map.
[RESET] Button	When selected, the values currently being used for the map replace the values currently being displayed in the entry fields.
[SAVE AS DEFAULT] Button	When selected, graticule element information is written to a user initialization file, and will be loaded and used the next time the *MapTool* program is started, or when a New map is selected.

The lower panel displays the attributes available for each element. The available attributes are:

Element Visible?	If [No] is selected, then the selected graticule element will not be displayed. If [Yes] is selected, then the element is displayed with the attributes shown.
Degree Interval:	For graticule elements that occur at geodetic intervals, this value is enabled. Enter a value in either decimal degrees, or whole degrees and minutes.
Meter Interval:	For graticule elements that occur at projected, cartesian coordinate intervals, this value is enabled.

Values are entered in meters.

Size: Specifies the "size" of the selected graticule element. Allowable selections are:

- Small: Thinnest line. Smallest size character.
- Medium: Normal line. Normal size character.
- Large: Wider line. Larger size character.
- Extra-Large: Widest line. Largest size character.

The actual, displayed or printed "size" of various elements is dependant on the output device.

Color: Specifies the color of the selected graticule element. Allowable selections are:

Black Blue Red Magenta
Green Cyan Yellow White

Font Style: Specifies the style of the characters to be used for the selected graticule element. Allowable selections are:

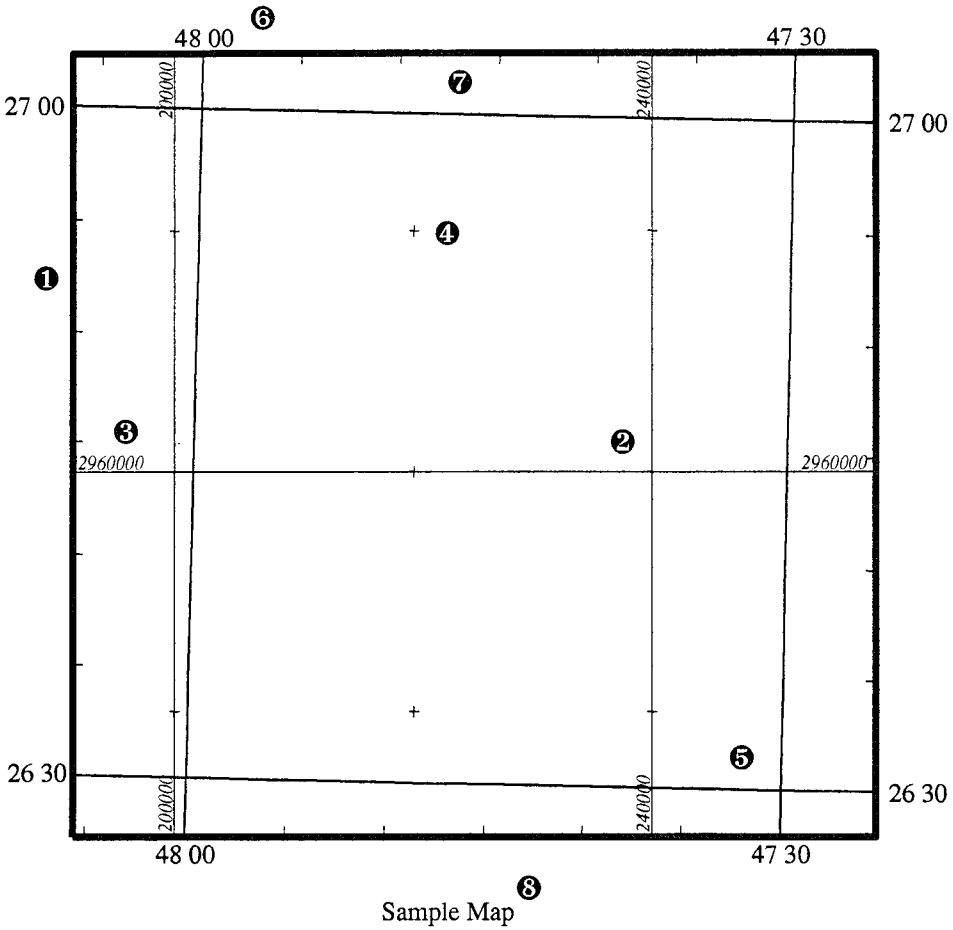
- Normal: A regular, serif font is used.
- Italic: An italic, serif font is used.
- Bold: A bold, serif font is used.
- Italic-Bold: An italic, bold, serif font is used.

Note that the actual font selected is dependant on the output device.

Line Style: Specifies the style of line to be used for the selected graticule element. Allowable selections are:

- Solid: A solid line is used.
- Dashed: A dashed line is used.
- Dotted: A dotted line is used.
- Dash-Dotted: A line with alternating dashes and dots is used.

The following figure (Figure 5-9) shows a sample chart, with all of the possible graticule elements being displayed:



❶ Bounding Box
❷ Meter Lines
❸ Meter Labels
❹ Meter Markers
❺ Lat-Lon Lines
❻ Lat-Lon Labels
❼ Lat-Lon Ticks
❽ Hardcopy Label

Figure 5-9. Sample Chart with All Graticule Elements Shown

5.4.5 Data Display

The Data Display is a menu that leads to individual menu items that control the display characteristics for each type of data supported by the *MapTool* program. For each data type, it is possible to modify the default properties — those that are used when data is first imported — and also to modify the display properties of previously imported data. Note that different sets of data of the same type can be displayed differently. For example, one set of navigation data may be

displayed in red, and another set in blue. In addition, it is possible to import the same data set more than once, and then display each instance with different properties.

5.4.5.1 Navigation Data...

The [illegible] menu item is used to select and modify the properties for the display of navigation data. When the menu item is selected, the "[illegible] Navigation Display Properties" pop-up window is displayed:

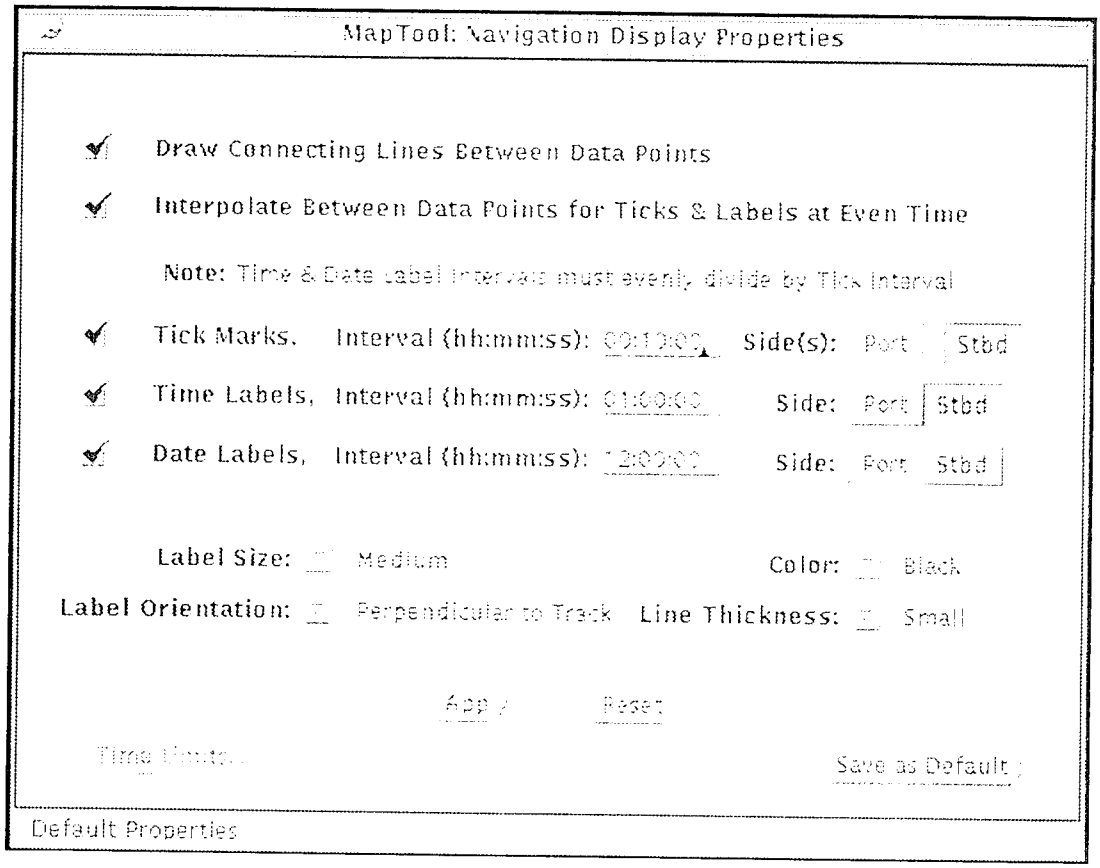


Figure 5-10. *MapTool* Navigation Display Properties

The display properties shown in the pop-up window are either the [illegible] Properties, which are used when new navigation data is imported, or are the properties associated with previously imported navigation data. In the former case, the left footer will indicate Default Properties. In the later case, the left footer will show the name of the navigation data file associated with the display properties. To select a previously imported navigation data file's display properties, first select the data file from the "[illegible] Data Summary" pop-up window.

The following are the navigation display properties available:

Draw Connecting Lines Between Data Points

When checked, a straight line will be drawn between successive navigation data points. Lines will be clipped inside the map area. If not selected, no line is drawn.

Interpolate Between Data Points for Ticks & Labels at Even Time

When checked, the position of ticks and labels are interpolated from the navigation data such that they are drawn exactly at the intervals specified, even if the frequency of data is different. If not selected, the ticks and labels will only be displayed at actual data points, and intervals will indicate the minimum time spacing between points.

For example, consider navigation collected at 15 second intervals (at :00, :15, :30, :45). If this setting is selected, and the tick interval is set to 20 seconds, then the actual data point at :00 will have a tick. The location of the next tick, at :20, will be interpolated between the data points at :15 and :30, the next between :30 and :45. If this setting is *not* selected, and the tick interval is still 20 seconds, while the first tick is drawn at the data point at :00, the next tick will be drawn at the data point at :30.

Tick Marks,

Tick marks are small lines drawn at a location along the navigation trackline. When checked, tick marks will be drawn. When not selected, no tick marks are drawn.

Interval (hh:mm:ss):

The interval to draw tick marks. Time values, in hours, minutes, and seconds, are entered separated by colons.

Side:

When [Port] is selected, the tick mark is drawn on the port (or left) side of the trackline. When [Stbd] is selected, tick marks are drawn on the starboard (or right) side. If both [Port] and [Stbd] are selected, then tick mark is drawn across the trackline. If neither selected, then no tick mark is drawn.

Time Labels,

Time labels may be drawn to indicate the time of a navigation data point. The hour, minute, and, optionally, the second of the data point is drawn.

Interval (hh:mm:ss):

The interval to draw time labels. Time values, in

hours, minutes, and seconds, are entered separated by colons. If the interval selected if less than one minute, then time labels will be displayed with the seconds field; otherwise, only hours and minutes are displayed.

Side: When [Port] is selected, the time label is drawn on the port (or left) side of the trackline. When [Stbd] is selected, the time label is drawn on the starboard (or right) side. One and only one side may be selected.

Date Labels, Date labels may be drawn to indicate the date of a navigation data point. The year and day of year are drawn.

Interval (hh:mm:ss): The interval to draw date labels. Time values, in hours, minutes, and seconds, are entered separated by colons.

Side: When [Port] is selected, the date label is drawn on the port (or left) side of the trackline. When [Stbd] is selected, the date label is drawn on the starboard (or right) side. One and only one side may be selected.

Label Size: Selects the size of labels to be drawn. Values range from "Small" to "Extra-Large".

Label Orientation: Determines the angle of ticks and labels. Possible values are:

Perpendicular to Track Ticks and labels are oriented perpendicular to consecutive navigation data points.

Horizontal Ticks and labels are oriented horizontally, such that labels appear in a normal direction on the screen.

Vertical Ticks and labels are oriented vertically, such that labels appear "sideways" on the screen.

Color: Selects the color of lines, ticks, and labels. Possible color values are:

Black	Blue	Red	Magenta
Green	Cyan	Yellow	White

Line Thickness: Selects the thickness of the trackline, if drawn. Values range from "Small" to "Extra-Large".

[APPLY] Button	When selected, values currently being displayed in entry fields become the current values for the navigation display.
[RESET] Button	When selected, the values currently being used for navigation display replace the values currently being displayed in the entry fields.
[SAVE AS DEFAULT] Button	When selected, values currently in entry fields are written to a user initialization file, and will be loaded and used as the default navigation data display properties the next time the *MapTool* program is started, or when a New map is selected.

The following figure (Figure 5-11) shows a typical navigation trackline, with graphical elements labelled:

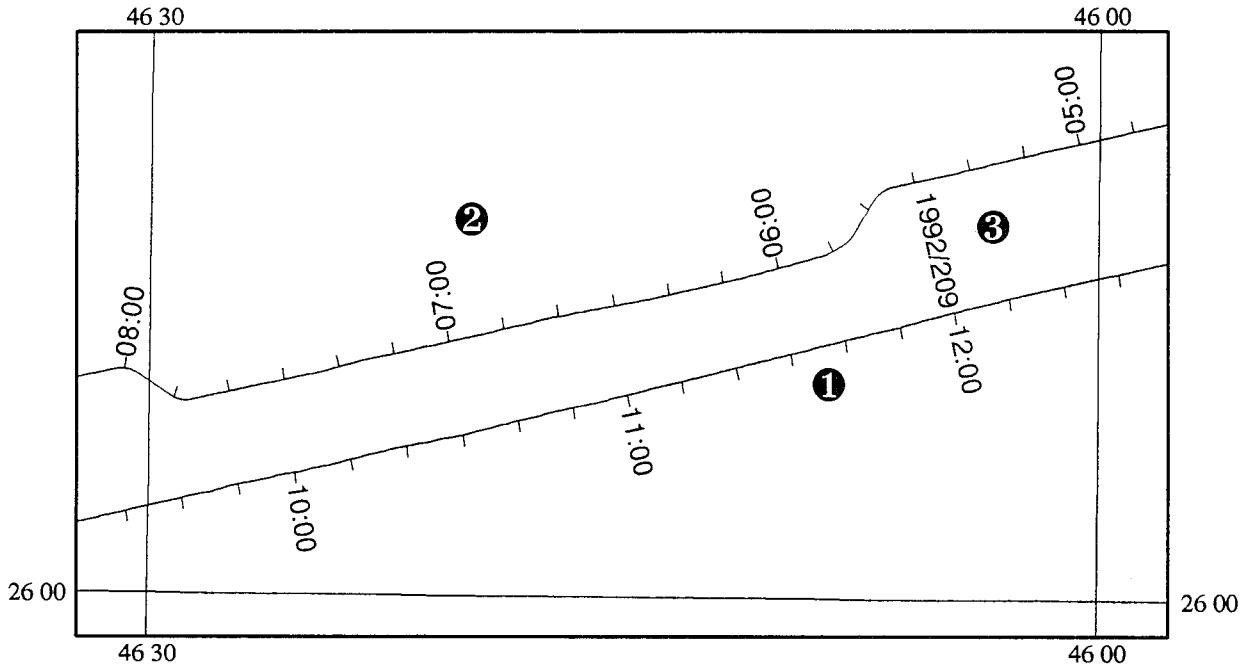


Figure 5-11. Sample Navigation Trackline

5.4.5.2 Multibeam Data...

The Multibeam Data... menu item is not available.

5.4.5.3 Grid Data...

The Grid Data... menu item is used to select and modify the properties for the display of gridded data. When the menu item is selected, the "MapTool: Grid Display Properties" pop-up window is displayed.

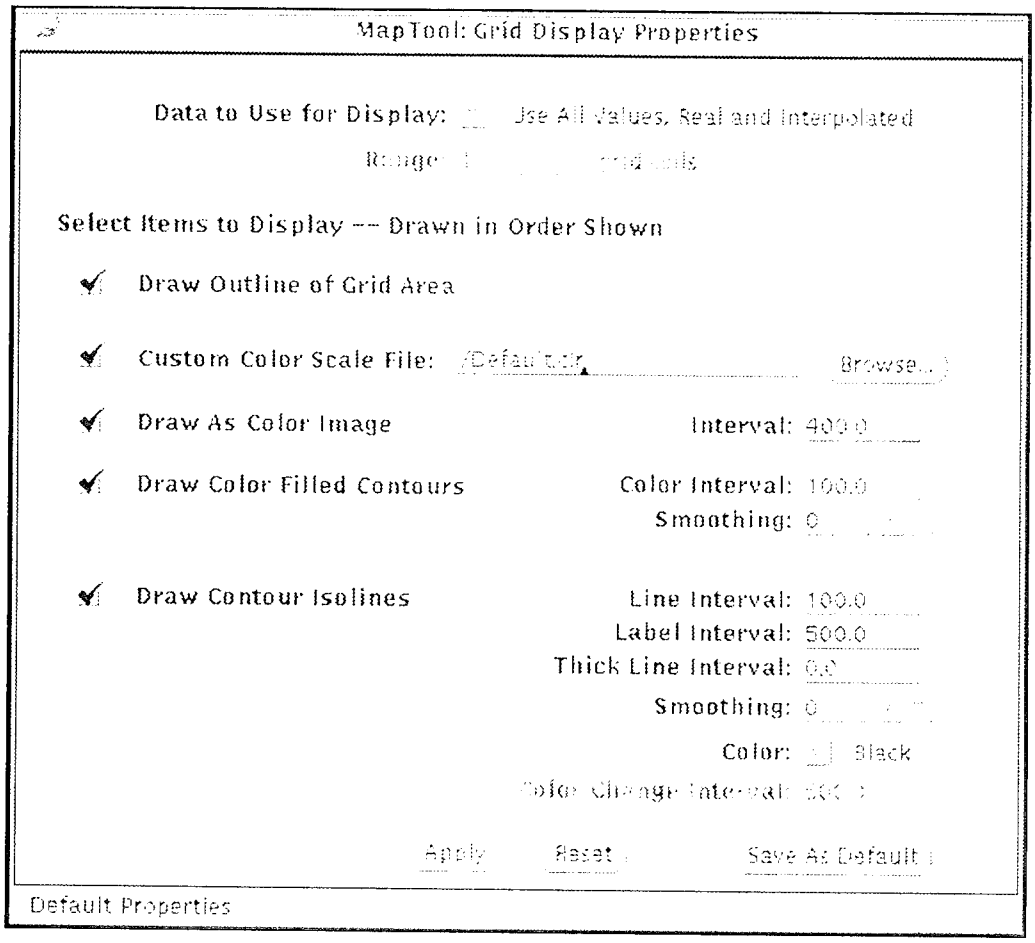


Figure 5-12. *MapTool* Grid Display Properties

The display properties shown in the pop-up window are either the Default Properties, which are used when new grid data is imported, or are the properties associated with previously imported grid data. In the former case, the left footer will indicate Default Properties. In the later case, the left footer will show the name of the grid file associated with the display properties. To select a a previously imported grid file's display properties, first select the data file from the "MapTool: Data Summary" pop-up window.

The following are the available grid data display properties:

Data to Use for Display:	Selects which data from the grid is to be used for display. Will only affect gridded data which has been created such that interpolated grid points are properly flagged. Possible settings are:
Use All Values, Real and Interpolated:	All values are used. Values that are interpolated are scaled to the proper range.
Use Only Real Values:	Only values that are flagged as "real" are used. Generally, these are grid points that contained at least one original data point prior to gridding.
Use Interpolated Values within Range:	All real values are used. In addition, interpolated values will be used if a grid point with a "real" data point is within a specified range of the interpolated grid point.
Range:	Specifies the number of grid cells to search for "real" data points. Allowable values range from 1 to 25.
Draw Outline of Grid Area:	Specifies whether to draw a solid color rectangle representing the location of the grid data. This setting is useful when locating chart boundaries relative to previously import grid data, since the outline can be drawn very quickly.
Custom Color Scale File:	When checked, allows for specifying the name of a custom color scale file to use for color images and color filled contours. When not checked, the default color scale is used.
[BROWSE...] Button	When this button is selected, a file popup window appears which allows for the selection of a custom color scale file.
Draw As Color Image:	Draw the selected grid data as an image, usually using a single color (general grey-scale) to denote intensity. An image is drawn by filling each grid cell with a single color based on its value.
Interval:	Selects the interval for image intensity changes. The range of values for which the interval is used is

taken from the attributes of the grid data.

`Draw ColorFilled Contours:` Draw color filled contours representing the selected grid data. Colors are taken from the currently active color table.

`Color Interval:` Selects the interval for color changes. The range of values for which the interval is used is taken from the attributes of the grid data.

`Smoothing:` Specifies the amount of smoothing desired. Smoothing is accomplished by generating extra node points inside each grid cell. Allowable values range from 0 (no extra smoothing) to 4 (maximum smoothing).

`Draw Contour Isolines:` Draw isolines representing the selected grid data. A variety of drawing options are available:

`Line Interval:` Selects the interval for drawing isolines.

`Label Interval:` Selects the interval for labelling isolines with their value. Must be a multiple of the `Line Interval`. Regardless of line color, labels are always drawn in `Black`. If this attribute is set to 0, then isolines will not be labelled.

`Thick Line Interval:` Selects the interval for drawing thick isolines. These can be used to highlight certain isolines. Must be a multiple of the `Line Interval`. If this attribute is set to 0, then no thick isolines will be displayed.

`Smoothing:` Specifies the amount of smoothing desired. Smoothing is accomplished by generating extra node points inside each grid cell. Allowable values range from 0 (no extra smoothing) to 4 (maximum smoothing).

`Color:` Specifies the color of the isolines to be drawn. Allowable fixed colors are:

`Black`	`Blue`	`Red`	`Magenta`
`Green`	`Cyan`	`Yellow`	`White`

In addition, the `Color` attribute can be set to an `Interval`, so that the color of isolines cycles through a set of colors. This option is normally only used when generating hardcopy to pen plotter devices.

`Color Change Interval:` Specifies the interval for changing isoline colors. The color sequence used is fixed: `Black`, `Red`, `Green` and `Blue`. Must be a multiple of the `Line Interval`.

[APPLY] Button	When selected, values currently being displayed in entry fields become the current values for the gridded data display.
[RESET] Button	When selected, the values currently being used for gridded data display replace the values currently being displayed in the entry fields.
[SAVE AS DEFAULT] Button	When selected, values currently in entry fields are written to a user initialization file, and will be loaded and used as the default grid data display properties the next time the *MapTool* program is started, or when a New map is selected.

The following figure (Figure 5-13) shows a sample Color Image display. In this sample, a monochromatic, custom color scale has been applied.

Figure 5-13. Sample Color Image Display

The following figure (Figure 5-14) shows an example of Color Filled Contours. In this example, the Color Interval has been selected as 200.

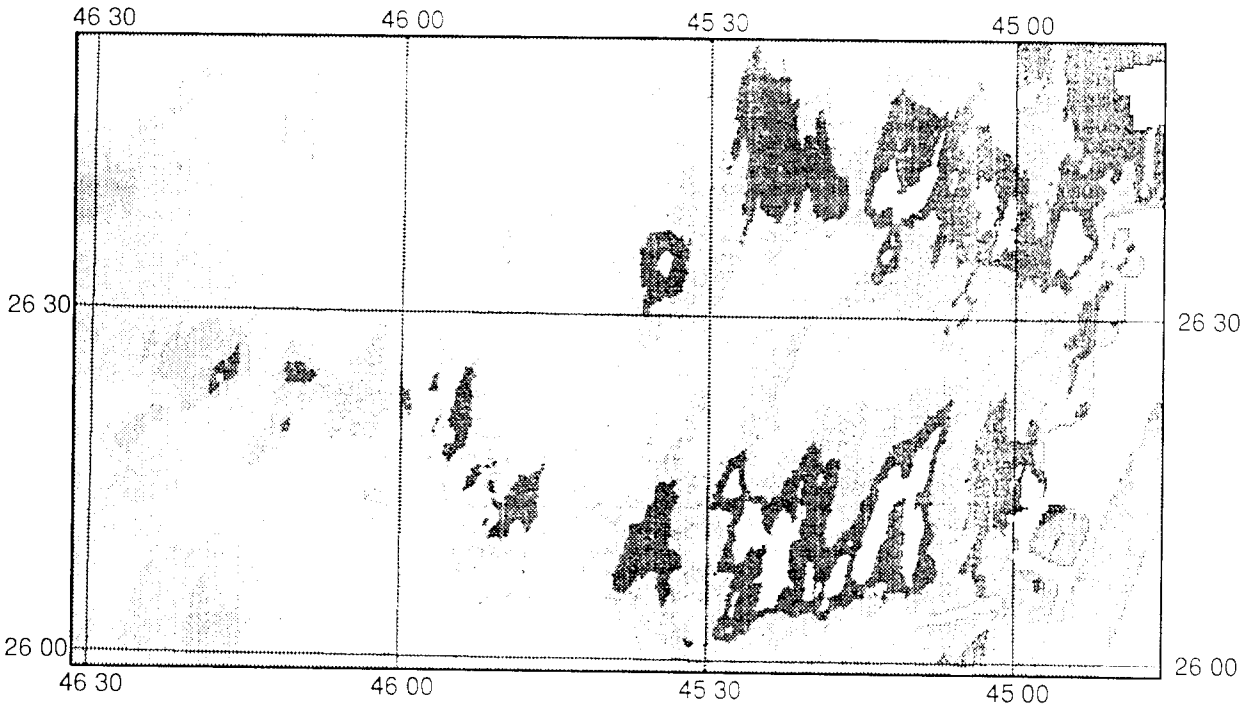


Figure 5-14. Sample Color Filled Contours.

The following figure (Figure 5-15) shows an example of Contour Isolines. In this example, the Line Interval is 200, the Label Interval is 1000, and the Thick Interval is 1000.

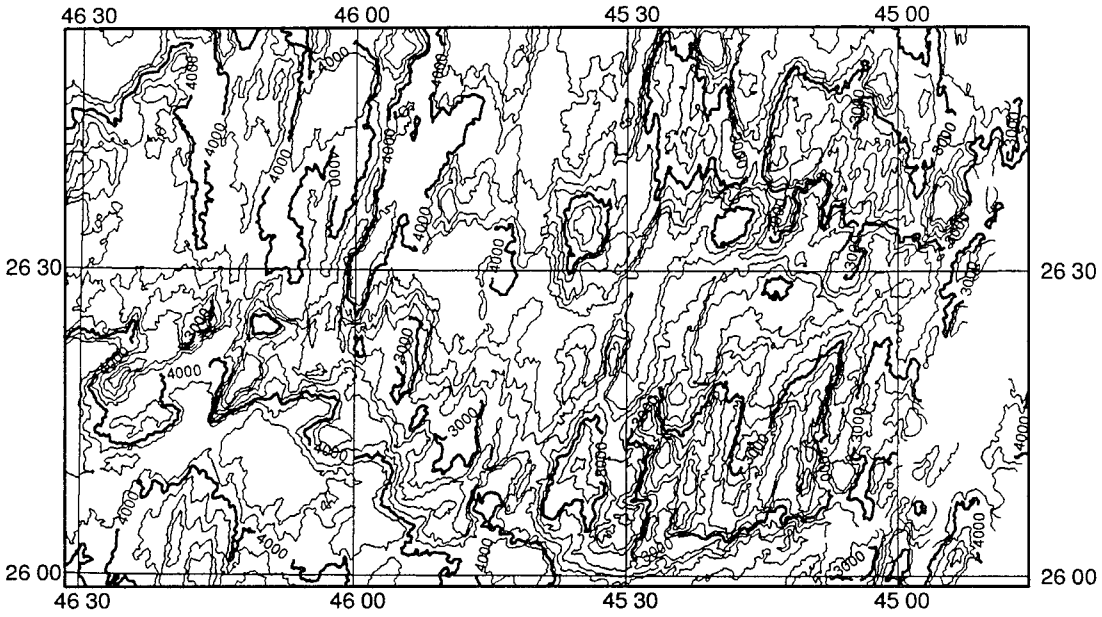


Figure 5-15. Sample Contour Isoline Display

5.4.5.4 Alongtrack Data

The `Alongtrack Data...` menu item is used to select and modify the properties for the display of along track data. Alongtrack data consists of a series of scalar values at a geodetic position. When the menu item is selected, the "`MapTool: Along Track Display Properties`" pop-up window is displayed:

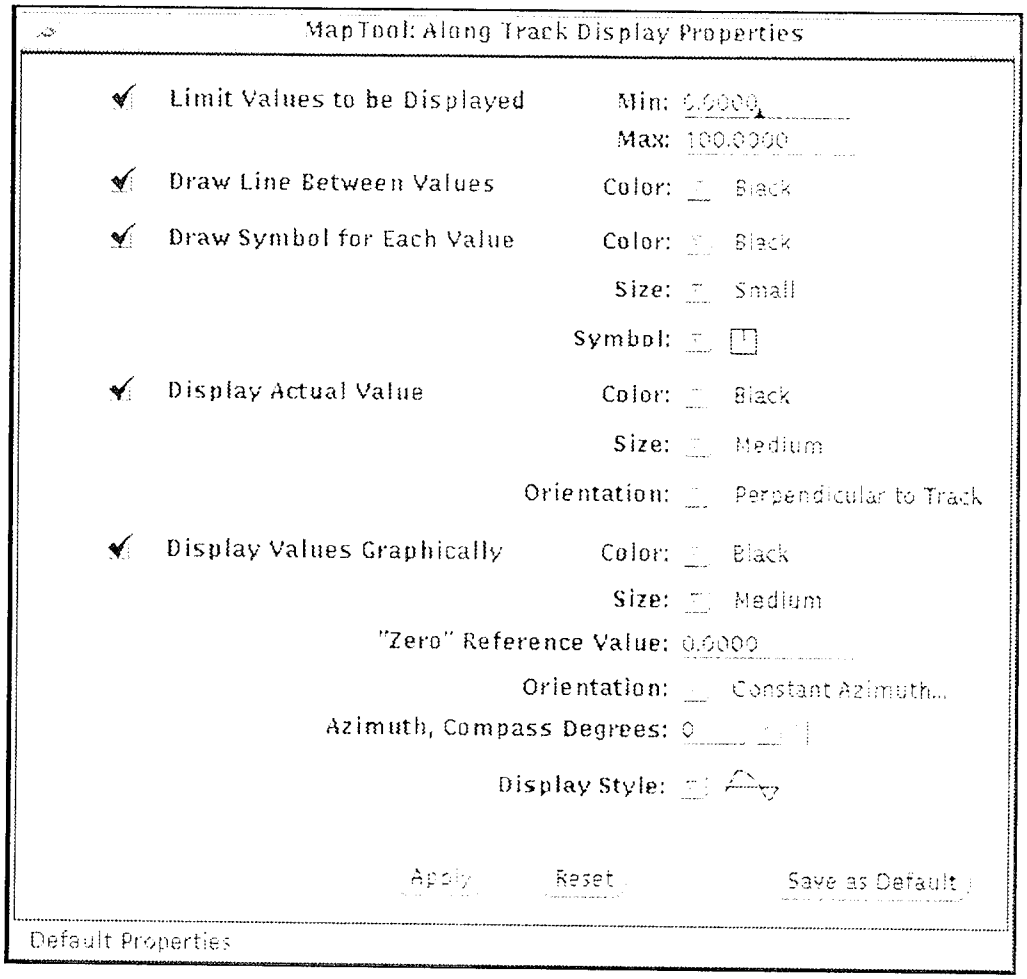


Figure 5-16. *MapTool* Along Track Display Properties

The display properties shown in the pop-up window are either the Default Properties, which are used when new alongtrack data is imported, or are the properties associated with previously imported alongtrack data. In the former case, the left footer will indicate `Default Properties`. In the later case, the left footer will show the name of the alongtrack file associated with the display properties. To select a previously imported alongtrack file's display properties, first select the data file from the "`MapTool: Data Summary`" pop-up window.

The following are the available alongtrack data display properties:

`Limit Values to be Displayed`
: When selected, only those data points with scalar values within the specified range are displayed. When not selected, all data points are used.

`Min:`
: The minimum scalar value to be used.

Max: The maximum scalar value to be used.

Draw Line Between Values: When selected, a solid line is drawn that connects consecutive points in geographic position. When not selected, connecting lines are not drawn.

Color: Specifies the color of the connecting line between consecutive points. Allowable colors are:

Black Blue Red Magenta
Green Cyan Yellow White

Draw Symbol for Each Value: When selected, a marker symbol is drawn at the location of each scalar value. When not selected, no marker is drawn. If selected, the follow options are available:

Color: Specifies the color of the marker. Allowable colors are:

Black Blue Red Magenta
Green Cyan Yellow White

Size: Specifies the size of the marker. Four "fixed" sizes are available:

Small Medium Large Extra-Large

In addition, a size of "Proportional to Value" is available. In this case, the size of the marker at the minimum scalar value will be "Small," and the size at the maximum scalar value will be "Extra-Large." Other markers will be scaled according to their scalar value.

Symbol: Specifies the marker to be displayed. Twelve different marker styles are available.

Display Actual Value: When selected, the numeric representation of the scalar value is displayed. The precision at which the value is displayed is dependant on the range of available data.

Color: Specifies the color of the value string. Allowable colors are:

Black Blue Red Magenta
Green Cyan Yellow White

Size: Specifies the size of the value string. Four "fixed" sizes are available:

Small Medium Large Extra-Large

Orientation: Determines the angle of value string. Possible

values are:

Perpendicular to Track — Value string is oriented perpendicular to consecutive data points.

Horizontal — Value string is oriented horizontally, such that labels appear in a normal direction on the screen.

Vertical — Value string is oriented vertically, such that labels appear "sideways" on the screen.

Display Values Graphically: — When selected, allows for displaying the magnitude of the scalar value in a graphical form. Allowable options for graphical display:

Color: — Specifies the color of the graphical display. Allowable colors are:

Black Blue Red Magenta
Green Cyan Yellow White

Size: — Specifies the overall scale of the graphical display. Four "fixed" scales are available:

Small Medium Large Extra-Large

"Zero" Reference Value: — Specifies the scalar value of the origin of the graphical display. The origin is defined as base line that connects consecutive points. For example, to produce a graphic display distributed on both "sides" of the base line, the "Zero" Reference Value attribute should be set to (Min+Max)/2.

Orientation: — Specifies the angle for the graphical display. Allowable options are:

Perpendicular to Track — The amplitude of the graphical display will be drawn perpendicular to the angle between consecutive data points.

Constant Azimuth... — The amplitude of the graphical display will be drawn at a constant azimuth.

Azimuth, Compass Degrees: — Specifies the azimuth, in whole degrees, for the amplitude of the graphical display.

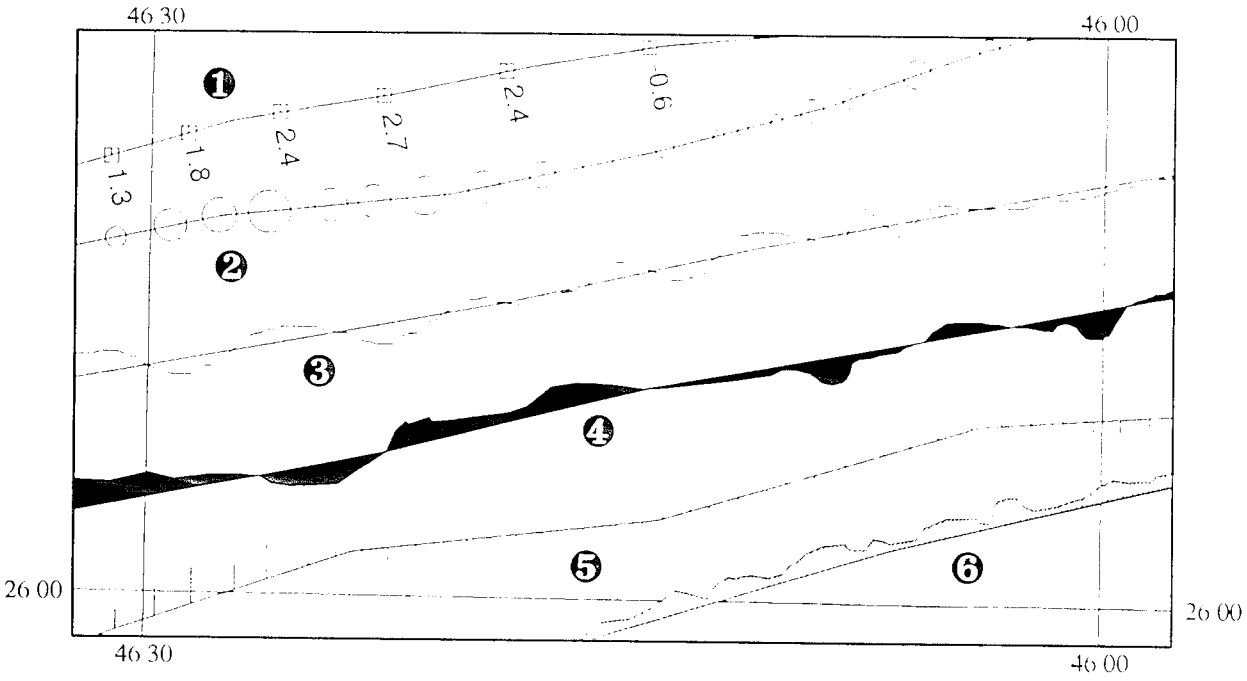
Display Style: — Specifies the type of graphic display to be generated. Three types of display are supported:

Wiggle Style — A solid line is used to connect consecutive, scaled values.

Filled-Wiggle Style — A solid line is used to connect consecutive, scaled

	values. In addition, the area between the solid line and the base line is filled with a solid color.
Vector Style	A solid vector line is drawn for each point, from the location of the point, in the angle specified, and scaled to the scalar value for the point.
[APPLY] Button	When selected, values currently being displayed in entry fields become the current values for the along track data display.
[RESET] Button	When selected, the values currently being used for along track data display replace the values currently being displayed in the entry fields.
[SAVE AS DEFAULT] Button	When selected, values currently in entry fields are written to a user initialization file, and will be loaded and used as the default along track data display properties the next time the *MapTool* program is started, or when a New map is selected.

The following figure (Figure 5-17) shows samples of various combinations of along track display parameters:



❶ - Symbol and Actual Value displayed.
❷ - Symbol displayed, with Size parameter set to "Proportional to Value."
❸ - Graphical Display, with Display Style parameter set to "Wiggle Style."
❹ - Graphical Display, with Display Style parameter set to "Filled-Wiggle Style."
❺ - Graphical Display, with Display Style parameter set to "Vector Style," and Orientation parameter set to "Vertical."
❻ - Graphical Display, with Display Style parameter set to "Filled-Wiggle Style," and "Zero Refernce Value" parameter set less than minimum value of data.

Figure 5-17. Sample Along Track Displays

5.4.5.5 Sidescan Data

The `Sidescan Data...` menu item is not available.

5.4.5.6 Image Data

The `Image Data...` menu item is not available.

Section 6 — Data Files

MapTool currently supports importing a number of different data files and types. In order to lessen the need to repeatedly convert potentially large data files from one format to another, the data handling portion of the *MapTool* program is built upon the concept of separate data *attributes* and data *records*. Data attributes are elements which describe the data — in many other data systems, this attribute information might be stored as header records embedded along with data records in a single data file. For the *MapTool* program, data attributes are always stored as plain, ASCII text files, using a consistent `<attribute-name>:<value>` notation. Attributes may be listed in any order, and unknown attributes may be omitted. In addition, attributes may be listed in a separate file from data records, or may be "pre-pended" to the beginning of the actual data record file.

The format of the actual data records is described via the data attribute mechanism. In this way, a variety of data record formats can be supported in their native mode. The data records may be in separate files from the attribute information. In this manner, it may not be necessary to reformat a data record file prior to importing. For example, some data types support reading values directly from MGD-77 type data record files. A single set of attributes may also describe a collection of data files that should be operated on as a group. Also, a single data record file may be described by multiple sets of attributes, so that different information can be conveniently extracted.

6.1 Navigation Data

Navigation data is defined a series of time-dependent positions, usually in sequential order. Navigation data be be stored in a separate file consisting of only time-position records, or navigation information can be extracted from files that contain multiple, time-dependant scalar or vector information. For a typical navigation attribute file, see Appendix B.

The currently defined navigation attributes consist of:

`Nav.version:`	*Must* be the first line of the attribute file. Set to "v1.0" .
`Nav.latMinimum:`	The minimum (southern) geodetic latitude limit of data. Values smaller than this value will not be used. Value is signed, decimal degrees.
`Nav.lonMinimum:`	The minimum (western) geodetic longitude limit of data. Values smaller than this value will not be used. Value is signed, decimal degrees.

`Nav.latMaximum:` The maximum (northern) geodetic latitude limit of data. Values larger than this value will not be used. Value is signed, decimal degrees.

`Nav.lonMaximum:` The maximum (eastern) geodetic longitude limit of data. Values smaller than this value will not be used. Value is signed, decimal degrees.

`Nav.timeMinimum:` The minimum time of data. Values smaller than this value will not be used. Value is expressed as "Year/Month/Day Hour:Minute:Second".

`Nav.timeMaximum:` The maximum time of data. Values larger than this value will not be used. Value is expressed as "Year/Month/Day Hour:Minute:Second".

`Nav.format:` The format type of the data records. Value is expressed as ASCII character string. Currently supported format types, with string, are:

`ASCII` ASCII records consist of three floating point numbers, separated by whitespace, terminated by a newline. First value is number of seconds since 1/1/1970. Second value is signed decimal degrees of latitude. Third value is signed decimal degree of longitude.

`BINARY` Binary records consist of continuous binary representations of time and position. The first value is time, expressed as a Unix `timeval` structure. The second value is latitude, expressed as a `double`, signed decimal degrees. The third value is longitude, also expressed as a `double`, signed decimal degrees.

`PNS` PNS records consist of multiple attributes along with time dependent positions. At present, PNS files are defined, maintained, and used by DSL.

`ASHTECH` Ashtech records consist of multiple attributes along with time dependent positions. These types of files are generated by the Ashtech GPS processing software.

`MGD77` MGD77 records consist of multiple attributes along with time dependent positions.

`PNSXY` PNSXY records consist of multiple attributes along with time dependent positions. Position data, however, is expressed in Cartesian coordinates (X,Y) rather than geodetic. At present, PNS files are defined, maintained, and used by DSL.

`URI, SIO, LDE` These formats are defined and maintained by the University

of Rhode Island, Scripps Institute of Oceanography, and Lamont-Doherty Earth Observatory. *These formats are not supported at this time.*

`Nav.location:` The location of data records relative to the file containing navigation attributes. There are three possible values for this attribute:

- `Internal` Data records are located within the same file as attributes. Data records begin after any header defined by the `Nav.headerLength` attribute.
- `External` Data records are located in a different file than the attributes. Data records begin after any header defined by `Nav.headerLength`.
- `List` Data records are located in multiple files outside of the attribute file. In this case, the full file and path name of each data file are located after the navigation attributes. For each data file, data records begin after any header defined by `Nav.headerLength`.

`Nav.fileName:` The file name of the file containing data records. This attribute is only needed when `Nav.location` is set to `External`.

`Nav.pathName:` The path, or directory, name of the file containing data records. This attribute is only needed when `Nav.location` is set to `External`.

`Nav.utmZone:` The UTM zone number used in constructing Cartesian coordinates (X,Y) of data in `PNSXY` format. This is expressed as an integer number, from 1 to 60.

`Nav.numPoints:` The maximum number of data records to be read by this set of attributes. If `Nav.location` is set to `List`, then this value should be the sum of data records in all listed files. When unsure of total number of records, estimate number on the high side to insure that all values will be read.

`Nav.headerLength:` The number of bytes prior to the beginning of the first data record. This is expressed as an integer number. If no header present, set value to 0. When the attribute `Nav.format` is set to `MGD77`, this value is the number of lines to skip prior to reading data. "Full" MGD77 file contain 24 lines. Some files, however, contain 0 lines.

6.2 Multibeam Data

Multibeam data is not supported at this time.

6.3 Gridded Data

Gridded data is defined as a two-dimensional array of scalar values, spaced at a uniform distance and located at a geographic position.

The currently defined grid attributes are:

`Grd.version:`	The version of the grid attribute file. Currently set to `"1.0_950_1.0"`
`Grd.creator:`	Character string which denotes the name of the program that produced the gridded data.
`Grd.creationTime:`	String which denotes the date and time the gridded data was created.
`Grd.class:`	String which denotes the general type or class of the gridded data. Examples are `"bathymetry"` or `"acoustic amplitude."`
`Grd.name:`	String specifying a name of the gridded data. May be used for labels, legends, etc.
`Grd.source:`	Specifies the source of the gridded data, or the data that was used to construct the grid.
`Grd.sourceTime:`	Specifies the date and time that the source of the data was created.
`Grd.comments:`	User-specified comments about the gridded data.
`Grd.sensorClass:`	Specifies the general type or class of the sensor used in acquiring the source data for the grid. Examples are `"sonar"` and `"magnetometer."`
`Grd.sensorName:`	Specifies the name of the sensor used in acquiring the source data for the grid.

`Grd.sensorConfigFileName:`	Specifies the name of a file that contains configuration information about the sensor used in acquiring the source data for the grid. Such information might consist of calibrations, switch settings, and so forth.
`Grd.sensorConfigFilePath:`	Specifies the path or directory name of the sensor configuration file.
`Grd.unit:`	Specifies the name of the units of the gridded data.
`Grd.precision:`	Numeric value specifying the precision of the gridded data, express in the number of bits. Simple raster data typical contains 8 bits of precsion, and single precision floating point data contains 6 bits.
`Grd.minimumValue:`	Numeric value specifying the smallest allowable value in the domain of data. Values less than this value are not used. Compare with `Grd.zMinimumValueFound`.
`Grd.maximumValue:`	Numeric value specifying the largest allowable value in the domain of data. Values greater than this value are not used. Compare with `Grd.zMaximumValueFound`.
`Grd.nullValue:`	Numeric value specifying the value given for missing values in the grid. Values equal to this value not used.
`Grd.specialValue:`	Numeric value specifying a value that has "special" meaning. Values that are "special" are represented in the grid as being outside of the domain of the data, but not null values. "Special" values may be converted to proper data by dividing by this attribute value. Note that not all software supports "special" values.
`Grd.nullValueFound:`	Logical flag (`"True"` or `"False"`) indicating whether a null value is present in the grid.
`Grd.specialValueFound:`	Logical flag (`"True"` or `"False"`) indicating whether a special value is present in the grid.

`Grd.xMinimumValueFound:` Numeric value specifying the smallest value in the x domain that has been found in the grid.

`Grd.xMaximumValueFound:` Numeric value specifying the largest value in the x domain that has been found in the grid

`Grd.yMinimumValueFound:` Numeric value specifying the smallest value in the y domain that has been found in the grid

`Grd.yMaximumValueFound:` Numeric value specifying the largest value in the y domain that has been found in the grid

`Grd.zMinimumValueFound:` Numeric value specifying the smallest, actual data value found in the grid. Compare with the attribute `Grd.minimumValue`.

`Grd.zMaximumValueFound:` Numeric value specifying the largest, actual data value found in the grid. Compare with the attribute `Grd.maximumValue`.

`Grd.projectionType:` Description of the type of projection used to transform from geodetic (lat,lon) reference to grid coordinates (x,y). Possible values are:

`None`	Azimuthal Stereo
`Mercator`	Transverse Mercator
`UTM`	Lambert Conformal Conic
`XY`	Local Vertical Tangent

`Grd.projectionEllipsoid:` Description of the ellipsoid used when transforming geodetic (lat,lon) to grid (x,y) coordinates. Possible values are:

`Sphere`	International-24
`WGS-72`	Clark-1866
`WGS-84`	Clark-1880

`Grd.projectionDatum:` Description of the datum used when transforming geodetic (lat,lon) to grid (x,y) coordinates. Possible values are:

`NAD-27`	`NAD-83`
`GRD-80`	

`Grd.projectionUTMZone:` Numeric value for the UTM zone number used when transforming geodetic (lat,lon) to grid (x,y) coordinates. Possible values are 1 to 60.

`Grd.projectionFalseEast:` Numeric value for False Easting used when transforming geodetic (lat,lon) to grid (x,y) coordinates.

`Grd.projectionFalseNorth:` Numeric value for False Northing used when transforming geodetic (lat,lon) to grid (x,y) coordinates.

`Grd.projectionCentralMerid:` Numeric value for the Central Meridian used when transforming geodetic (lat,lon) to grid (x,y) coordinates.

`Grd.projectionBaseLatitude:` Numeric value for the Base Latitude used when transforming geodetic (lat,lon) to grid (x,y) coordinates.

`Grd.projectionStdParallel1:` Numeric value for Standard Parallell #1 used when transforming geodetic (lat,lon) to grid (x,y) coordinates.

`Grd.projectionStdParallel2:` Numeric value for Standard Parallell #2 used when transforming geodetic (lat,lon) to grid (x,y) coordinates.

`Grd.projectionCentralScale:` Numeric value for the Central Scale factor used when transforming geodetic (lat,lon) to grid (x,y) coordinates.

`Grd.coordinateUnit:` String specifying the name of the units used for grid coordinates. Examples are "`meters`" or "`degrees`."

`Grd.coordinateSense:` String specifying coordinate convention for the orientation of the x,y, and z axis of the grid. Two possible values are "`Right-Hand`" or "`Left-Hand`."

`Grd.coordinateLattice:` String specifying the location of grid values relative to the grid coordinates. Two possible values are:

`Grid` A "`Grid`" lattice is one where the grid values are located at the intersection of x and y grid coordinates.

`Lattice` A "`Lattice`" lattice is one where the grid values are located at the center of a rectangle, who's borders are defined by the x and y grid coordinates.

`Grd.xOrigin:` Numeric value specifying the value, in grid coordinates, of the x origin of the gridded data.

`Grd.yOrigin:` Numeric value specifying the value, in grid coordinates, of the y origin of the gridded data.

`Grd.zOrigin:` Numeric value specifying the origin of the gridded data values. This value will be added *after* any scaling is performed (See `Grd.zScale`).

`Grd.xScale:` Numeric value specifying the scale factor for grid coordinates in the x domain. This value can also be considered as the x grid interval.

`Grd.yScale:` Numeric value specifying the scale factor for grid coordinates in the y domain. This value can also be considered as the y grid interval.

`Grd.zScale:` Numeric value specifying the scale factor of the gridded data value. The actual data stored is multipled by this value prior to use.

`Grd.zRotation:` Numeric value specifying the angle of rotation of the gridded data. Angles are expressed in decimal degrees, based on coordinate sense.

`Grd.format:` String specifying the actual format of the gridded data file. Allowable values are:

`Sun Raster`	A simple raster format. See `rasterfile(5)`.
`Surface Binary`	A floating point format, produced by some gridding programs.
`GMT`	A grid format used by the GMT-Series of programs. *Not currently implemented.*
`Matlab`	A grid format used by the Matlab program. *Not currently implemented.*

`Grd.screen:` Logical flag ("True" or "False") indicating the row-order of grid data. When set to True, then row-order is top-down. When set to False, then row-order is bottom-up.

`Grd.compression:` String specifying the name of the compression algorithm used to store the data.

`Grd.type:` String specifying the data type of each stored grid value. Possible values are:

`Tiny`	`Short`	`Integer`	`Single`
`Double`	`ASCII`	`Complex`	`Single`

`Grd.depth:` Numeric value specifying the number of bits per stored grid value. Typical values are `8`, `16`, `32`, and so forth.

`Grd.dimension:` Numeric value specifying the number of individual values that make up a single grid value.

`Grd.sequence:` String specifying the sequence of mult-dimensional grid values. Possible values are:

`Sequential` All values of a single dimension are stored sequentially, followed by all values of the next dimension, and so forth.

`Interleaved` All values from all dimensions for a single grid element are stored, followed by all values for the next element, and so forth.

`Grd.order:` String specifying the order in which grid data is stored. Possible values are:

`Row-Major` Values are stored row by row.

`Column-Major` Values are stored column-by-column.

`Grd.xSize:` Numeric value specifying the number of elements in the x dimension — also the number of "columns."

`Grd.ySize:` Numeric value specifying the number of elements in the y dimension — also the number of "rows."

`Grd.headerLength:` Numeric value specifying the number of bytes of header information in the gridded data file. The first byte of actual grid data is assumed to be directly after any header information.

`Grd.location:` String specifying the location of the gridded data described. Possible values are:

`External` Gridded data is contained in an external file, not this attribute file.

`Internal` Gridded data is appended to the end of this attribute file, after the attribute terminator character [`CTRL/L`].

First comes the header then the data.

`Grd.deviceName:` Character string specifying the name of the physical device on which the gridded data is physically stored. Normally only used when the device is *not* an on-line disk medium. For example, may be used to specify an off-line tape device.

`Grd.volumeName:` Character string specifying the name of the volume on which the gridded data is physically stored. Normally only used when the device is not an on-line disk medium. For example, may be used to specify the name or label of a magnetic tape.

`Grd.fileName:` Character string specifying the file name the gridded data file, used when the `Grd.location` is `External`.

`Grd.filePath:` Character string specifying the path or directory name of the gridded data file, used when the `Grd.location` is `External`.

6.4 Alongtrack Data

Alongtrack data is defined as a series of data values, each with an associated geographic position. Data values can be either a scalar value (i.e. sediment thickness) or a descriptive string (i.e. "Dredge Site #6"). Alongtrack data can be stored in a separate file consisting of positions and values, or can be extracted from files that contain multiple data values per position.

The currently defined alongtrack attributes consist of:

`Atk.version:` Must be the first line of the attribute file. Currently set to "v1.0".

`Atk.latMinimum:` The minimum (southern) geodetic latitude limit of the data. Values less than this value will not be used. Value is signed, decimal degrees.

`Atk.lonMinimum:` The minimum (western) geodetic longitude limit of the data. Values less than this value will not be used. Value is signed, decimal degrees.

`Atk.latMaximum:` The maximum (northern) geodetic latitude limit of the data.

Values greater than this value will not be used. Value is signed, decimal degrees.

`Atk.lonMinimum:` The maximum (eastern) geodetic longitude limit of the data. Values greater than this value will not be used. Value is signed, decimal degrees.

`Atk.valueMinimum:` The minimum value in the domain of scalar values. Value is signed, floating point value.

`Atk.valueMaximum:` The maximum value is the domain of scalar values. Value is signed, floating point value.

`Atk.valueName:` Character string describing the scalar values. To be used for labelling purposes.

`Atk.valueUnits:` Character string describing the units of the scalar values.

`Atk.type:` Specifies the type of alongtrack data. Valid attributes are "`Value`" for scalar values, or "`String`" for character string values.

`Atk.format:` Specifies the format of alongtrack data. Allowable values are:

`ASCII` Values are in simple ASCII format, consisting of latitude (decimal degrees), longitude (decimal degrees), and value (either floating point value or character string), each separated by whitespace, and terminated by a newline.

`BINARY` Values are in binary format, consisting of latitude (double degrees), longitude (`double` degrees), and scalar value (`double`). Character values are *not* supported in binary format.

`DSL` Values are in an ASCII format as supported by WHOI Deep Submergence Laboratory. This format supports multiple data values per position record.

`MGD77` Values are in *"The Marine Geophysical Data Exchange Format - MGD77."* This format supports multiple data values per position record.

`Atk.record:` Specifies which record to use when accessing data that contains multiple data values per position. This value is dependant on the format of the data.

for `DSL` format: The first eight columns in this format are fixed. The

Atk.FixedInt attribute points to the column number after the eighth column of fixed data. Use 1 for the first column, 2 for the second, and so forth.

for MGD77 format: This format contains multiple values per record. To select a value, set this attribute to:

1	Two-way traveltime in seconds.
2	Bathymetry, corrected depth in meters.
3	Magnetics, Total Field, 1st sensor.
4	Magnetics, Total Field, 2nd sensor.
5	Magnetics Residual Field.
6	Magnetics Diurnal Corrrection.
7	Depth or Altitude of Lead Magnetic Sensor.
8	Observed Gravity.
9	Eotvos Correction.
10	Free-air Anomaly.

See *"The Marine Geophysical Data Exchange Format - MGD77"* for full specifications of these values.

Atk.LatColumn: Specifies which column in a record contains the floating point latitude value. This attribute is only used when the format is set to ASCII. The default value is 1. Column numbering begins with 1.

Atk.LonColumn: Specifies which column in a record contains the floating point longitude value. This attribute is only used when the format is set to ASCII. The default value is 2. Column numbering begins with 1.

Atk.valueColumn: Specifies which column in a record contains the floating point numberic value to be used for display. This attribute is only used when the format is set to ASCII. The default value is 3. Column numbering begins with 1.

Atk.location: Location of the data records relative to the file containing these alongtrack attributes. Three possible values are:

Internal	Data records are located within the same file as attributes. Data records begin after any header information defined by Atk.headerLength.
External	Data records are located in a different file that attributes, as defined by attribute Atk.FilePath and Atk.FileName.
List	Data records are located in multiple files outside of the attribute file. The full path and filename of each data file are located after the end of attributes, one per line.

`Atk.fileName:`	The file name of the file containing data records. This attribute is only needed when `Atk.location` is set to `External`.
`Atk.filePath:`	The path, or directory, name of the file containing data records. This attribute is only needed when `Atk.location` is set to `External`.
`Atk.numPoints:`	The maximum number of data records to be read by this set of attributes. If `Atk.location` is set to `List`, this value should be set to the sum of data records in all files. When unsure of total number, estimate value on high side to insure all values will be read.
`Atk.headerLength:`	The number of bytes prior to the beginning of the first data record. If no header present, set value to 0. When the attribute `Atk.format` is set to `MGD77`, this value is the number of lines to skip prior to reading data. "Full" MGD77 file contain 24 lines. Some files, however, contain 0 lines.

6.5 Sidescan Data

Sidescan data is not supported at this time.

6.6 Image Data

Image data is not supported at this time.

Section 7 — Hardcopy

This section describes the procedures necessary to produce hard copy, paper-based outputs from the *MapTool* program. At present, the *MapTool* program only produces external files, which the user must further process outside of the *MapTool* program in order to actually generate hard copy.

7.1 PostScript Output

The MapTool program is capable of generating a variety of styles of PostScript files, depending on the hard copy requirement. Options for generating PostScript are set in the "MapTool: Print PostScript" pop-up window, which is invoked be choosing the "Print ...PostScript" menu item from the "File" menu button.

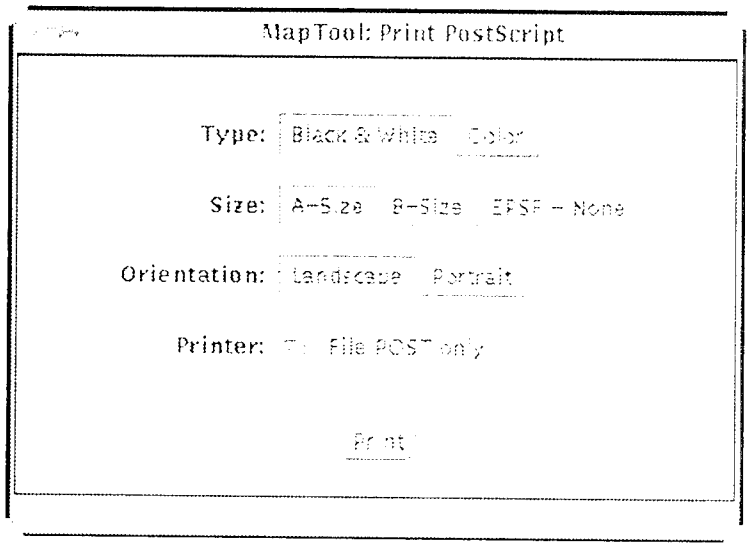


Figure 7-1. *MapTool* Print PostScript

The following options are available:

Type:	Selects the type of PostScript file to generate. Available selections are:
Black & White	Produces PostScript commands such that color values are mapped to black and white patterns by the MapTool program.
Color	Produces PostScript commands using actual colors as seen in the MapTool display.

`Size:`	Selects the size of the paper for the PostScript page. Allowable selections are:
`A-Size`	Will generate PostScript commands for A-Size (8.5" x 11") paper.
`B-Size`	Will generate PostScript commands for B-Size (11" x 17") paper.
`EPSF-None`	Will generate Encapsulated PostScript commands. In this case, there is no absolute size specified. Rather, EPSF files are designed to be used by other graphics programs, which will determine size on their own.
`Orientation:`	Determines the orientation of the X/Y axis with respect to the page. Available settings are:
`Landscape`	Produces PostScript commands such that default printing or viewing will produce a map oriented with X-axis (normally the longitude) along the "long" edge of the paper.
`Portrait`	Produces PostScript commands such that default printing or viewing will produce a map oriented with the Y-axis (normally the latitude) along the "long" edge of the paper.
`Printer:`	Selects the printer destination. Available settings are:
`File POST only`	At present, all PostScript output will be sent to a file defined by the environmental variable `POST`, as described in Section 2.2, "Environmental Initiation." If this environment variable is not set, then output will be sent to a file named `"POST"` in the directory from which the *MapTool* program was started. In either case, if a file previously exists with the same name, the *MapTool* program will overwrite it.

When the correct settings have been made, use the [SELECT] button on the mouse to activate the [PRINT] button in the pop-up window. The PostScript file will then be generated. To actually print the PostScript file on a printer, use standard Unix printing commands. If this file needs to be saved for subsequent printing or viewing, make sure to move to a different directory or rename the file, since the *MapTool* program will overwrite the file the next time PostScript printing occurs.

7.2 Rasterfile (Raytheon Printer) Output

The MapTool program is capable of creating "true-scale" Sun rasterfiles, which can be used by other programs, or printed on a Raytheon TDU-850 Continuous Tone printer. The generation of rasterfiles is actually a two-step process (with a third step when printing on the Raytheon printer). The first step takes place inside the MapTool program. Options for generating raster files are set in the "MapTool: Print Rasterfile" pop-up window, which is invoked by choosing the "Print...Rasterfile" menu item from the "File" menu button.

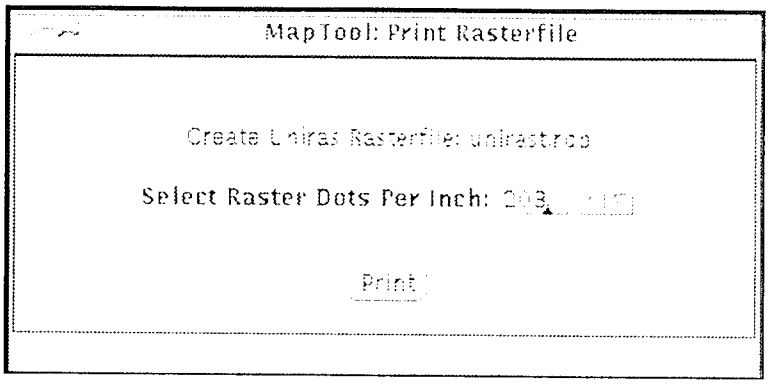


Figure 7-2. *MapTool* Print Rasterfile

The following options are available:

Select Raster Dots Per Inch:	Choose the pixel density for the output rasterfile. Valid values range from 72 dpi to 400 dpi. The Raytheon printer requires 203 dpi for "true scale."

The size of the output raster is determined by two factors: (1) The Map Scale as selected in the "Chart Properties" pop-up window, and (2) the pixel density selected here in the "Print Rasterfile" pop-up window. When the correct settings have been made, use the [SELECT] button on the mouse to activate the [PRINT] button in the pop-up window.

The actual output from this first step is an intermediate file called a *uniras* file. This file contains a raster representation of the map, in a proprietary, Uniras-derived format. The actual file written is derived from the environmental variable uniras, as defined in Section 2.2, "Environmental Initiation." If this environmental variable has not been defined, then the file written will be call uniras.rdf, located in whatever directory the *MapTool* program was started. If this file needs to be saved for subsequent processing, make sure to move to a different directory or rename the file, since the *MapTool* program will overwrite the file the next time RasterFile printing occurs.

Once the unirast file has been created, use the utility program "uni2ras" to convert it to a Sun rasterfile. The device name for Sun rasterfile is "SSUNRAS." To run this utility with the proper device, invoke the program:

```
% uni2ras -device SSUNRAS
```

in the directory the unirast file was created. This utility program will create a Sun rasterfile with a name derived from the environmental variable SUNRAS, as defined in Section 2.2, "Environmental Initiation." If this environmental variable has not been defined, then the file written will be call SUNRAS, located in whichever directory the uni2ras utility was run. Once again, if this file needs to be saved for subsequent processing, make sure to move to a different directory or rename the file, since the uni2ras program will overwrite the file the next time it is run.

7.3 Plotfile (HPGL2) Output

The *MapTool* program is also capable of generating Plotfiles of drawing information that can be used to make full resolution, "true-scale" maps on a large format plotter. At present, only HPGL2 formatted Plotfiles can be generated. Plotfiles, as opposed to raster files, contain a description of the graphical elements (lines, colors, text, etc.) to be displayed or plotted. These Plotfiles may be spooled to plotters, using standard Unix printing commands, in order to generate hard copy. Creation of the Plotfile is accomplished from the "MapTool: Print Plotfile" pop-up window, which is invoked by choosing the "Print...Plotfile" menu item from the "File" menu button.

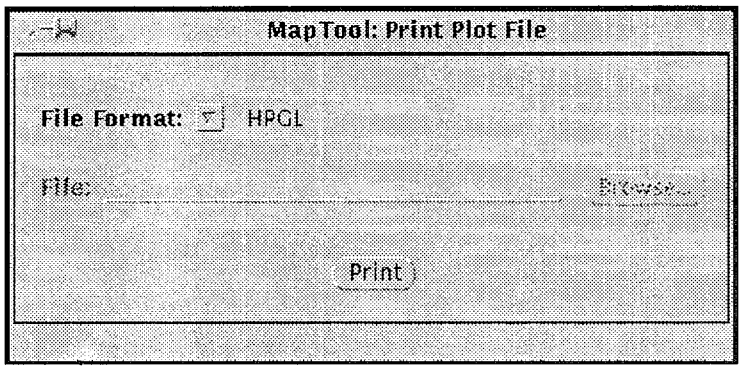


Figure 7-3. *MapTool* Print Plot File

There are no options when generating Plotfiles, as the map to be drawn is fully described by display and data attributes selected in other areas. Use the [SELECT] button on the mouse to activate the [PRINT] button in the pop-up window. This will create a Plotfile, with a name derived from the environmental variable HPGL2, as defined in Section 2.2, "Environmental Initiation." If this environmental variable has not been defined, then the file written will be call HPGL2, located

in whichever directory the *MapTool* program was run. If this file needs to be saved for subsequent processing, make sure to move to a different directory or rename the file, since the *MapTool* program will overwrite the file the next time Plotfile printing occurs.

Appendix A — Map Projections

The purpose of a map projection is to represent all or part of the surface of the Earth on a flat plane. This is accomplished by transforming coordinates in one reference system to another. A *forward transformation* converts geodetic coordinates (longitude and latitude) to Cartesian coordinates (X and Y). An *inverse transformation* converts Cartesian coordinates to geodetic coordinates. All transformations are governed by a set of parameters that define the relationship between fixed points on the Earth and points on a flat plane. Common parameters are shown in Figure A-1.

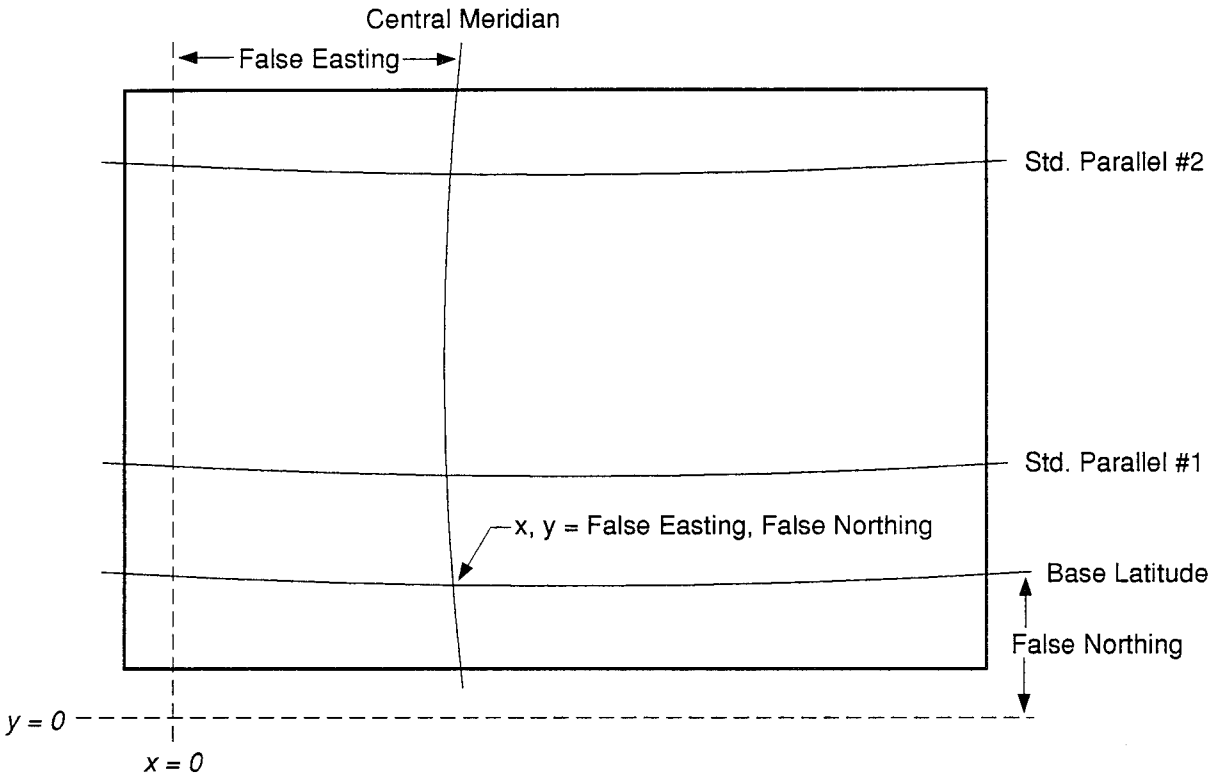


Figure A-1. Common Map Projection Parameters

It is important to emphasize that knowledge of the projection parameters used in the construction of a transformation is essential if reproducibility is required, or if merging with previous map-based information.

A.1 False Easting, False Northing

The parameters `False Easting` and `False Northing` are used as offsets of the transformed Cartesian coordinates (X and Y). These parameters are used so that X,Y coordinates will fall into a more convenient range. For example, with some projections, geodetic coordinates

south of the Base Latitude or west of the Central Meridian would normally transform to negative Cartesian coordinate. If an appropriate False Easting and/or False Northing is applied, then all Cartesian coordinates would be positive numbers. Thus, it might be said that the False Easting and False Northing are the Cartesian coordinates assigned to the point of interaction between the Central Meridian and Base Latitude.

Note that with the UTM projection, False Easting is defined as 500,000 m. False Northing is defined as 0 m in the northern hemisphere, and 1,000,000 m in the southern hemisphere.

A.2 Central Meridian, Base Latitude

Many map projections require that a specific longitude and latitude be designated as the origin of projected coordinates. For some forms of cylindrical projections, a meridian or parallel is designated to be the intersection between the Earth and a cylinder which is then "unrolled" to form a flat plane. In any case, the designated longitude is referred to as the Central Meridian, and the designated latitude is referred to as the Base Latitude. Some projections define the allowable choices for these parameters. For example, with the UTM projection, the Base Latitude is defined as the Equator, and the Central Meridian is chosen based on the longitude of the area of interest.

A.3 Central Scale Factor

No map projection can maintain the correct scale in all directions for all points in a map. In order to compensate for this distortion and to distribute it over the map area, a scale factor is applied to all x/y coordinates. This factor, the Central Scale Factor, is a constant, usually set to be close to 1.

A.4 Ellipsoids

The shape of the Earth for mapping purposes can be described as an oblate ellipsoid of revolution, or oblate spheroid. This is an ellipse rotated about its shorter axis. As technology has changed, geodesists have developed more refined models and measurements of the the two principal radii (referred to as the equatorial and polar radius).

The following are the ellipsoids available with the *MapTool* program:

Name	*Equatorial Radius, a (meters)*	*Polar Radius, b (meters)*	*Note*
Sphere	6,371,000	6,371,000	

WGS 1984	6,378,137	6,356,752.3	Same as GRS 1980
WGS 1972	6,378,135	6,356,750.5	
International 1924	6,378,388	6,356,911.9	
Clarke 1880	6,378,249.1	6,356,514.9	
Clarke 1866	6,378,206.4	6,356,583.8	

A.5 Standard Parallels

Conic projections require specifying latitudes which are true to scale and free of distortion. In some cases, the flat plane is constructed by "unrolling" a cone that intersects the Earth along one or two lines of constant latitude. These lines are referred to as the Standard Parallels. These parallels become arcs of concentric circles, which may or may not be equally spaced, depending on the actual projection used. In general, these values are selected to be close to the map area of interest.

A.6 Projection Types

Map projections may be characterized in a variety of ways, but are generally done so by the technique used in the transformation. Additionally, each general class of projection introduces limitations in term of distortions, preservation of shapes and direction, and appropriate useage. The *MapTool* program supports three general types of projections, which can be used with a variety of data types.

Cylindrical projections use the concept of a cylinder that is "wrapped" around the Earth, which when "unrolled" forms a flat plane. The cylinder commonly intersects the Earth along a meridian or parallel, although other oblique orientations are also possible. At present, the *MapTool* program supports two common cylindrical projections. The `Mercator` projection is normally oriented such that the cylinder intersects the Earth along the Equator, though other latitudes are possible as well. This type of projection is well suited toThe `Transverse Mercator` projection is oriented such that the cylinder intersects the Earth along the map's Central Merdian. A special case of the `Transverse Mercator` projection is the `Universal Transverse Mercator` (UTM) projection. In this case, the map projection parameters are specified based on the `UTM Zone` number of the area of interest. Zones are six degrees of longitude wide, and are numbered from `1` to `60` proceeding east from the 180th meridian from Greenwich.

Conic projections use the concept of a cone that is placed at the top of a globe representing the Earth, the tip of which is aligned with the axis of the globe, and the sides of the cone touching or tangent to the globe along specified parallels. The cone is "cut" along a specified meridian, and "unrolled" to form a flat plane. At present, the *MapTool* program supports `Lambert Conformal` conic projection.

A third category of map projections are azimuthal projections, which are formed by a reference plane that is usually tangent to the Earth at some point. Unlike cylindrical or conic projections, most azimuthal projections maintain a true perspective, which is desireable when display large (hemisphere scale) areas. At present, the *MapTool* program supports the Azimuthal Stereographic projection.

A.7 Natural Scale versus "Inches per Degree"

While the *MapTool* program uses a Natural Scale method for generating hardcopy, some mapping systems use a designation of "Inches Per Degree" for scaling purposes. In general, this scale is only used for Mercator projections, with the value representing the number of inches per degree of longitude at the equator.

In order to construct maps that match ones made with "Inches per Degree" scale, try the following:

- Using the Chart Projection Popup Window, select a Projection of Mercator.
- Select the appropriate False Easting and False Northing. These parameters will not affect the scaling process.
- Select the appropriate Central Meridian and Base Latitude. In general, the Central Meridian value should be near the map area. The Base Latitude should be set to 0 (equator).
- Select an appropriate Central Scale Factor. This should normally be set to 1.
- The Scale to use will be dependant on the Ellipsoid selected. For the WGS-84 ellipsoid, the following table may be used.

Inches per Degree	*Natural Scale*	*Natural Scale*	*Inches per Degree*
1	1:4,382,657	1:5,000,000	0.8765
2	1:2,191,329	1:2,500,000	1.7531
4	1:1,095,664	1:1,000,000	4.3827
8	1:547,832	1:500,000	8.7653
16	1:273,916	1:250,000	17.5306
32	1:136,958	1:100,000	43.8266
64	1:68,479	1:50,000	87.6531
128	1:34,240	1:25,000	175.3063
256	1:17,120	1:10,000	438.2657

A.8 Further Information

This appendix can only touch on brief aspects of the art and science of map projections.

Additional information concerning map projections can be found in the following:

Evenden, G.I., 1983, "Cartographic Projection Procedures for the UNIX Environment — A User's Manual," U.S. Geological Survey Open-File Report 90-284.

Snyder, J.P., 1987, "Map Projections — A Working Manual," U.S. Geological Survey Professional Paper 1395.

Appendix B — Sample Data Attribute Files

This Appendix presents sample data attribute files. Additional sample files may be found in the directory [illegible]. Note that since some attributes are only valid when other attributes are set, it is impossible to present all variations in a single sample.

B.1 Navigation Attribute File for MGD77 Data

```
Nav.Version:              [illegible]

Nav.LatMinimum:           [illegible]
Nav.LonMinimum:           [illegible]
Nav.LatMaximum:           [illegible]
Nav.LonMaximum:           [illegible]

Nav.TimeMinimum:          [illegible]
Nav.TimeMaximum:          [illegible]

Nav.Format:               [illegible]

Nav.[illegible]:          [illegible]
Nav.FileName:             [illegible]
Nav.[illegible]:          [illegible]

Nav.[illegible]:          [illegible]
Nav.HeaderLength:         [illegible]
[illegible]
[end of file]
```

In this example, note that the attribute Nav.HeaderLength is set to 24. This denotes that the data file is a "Full" implementation of MGD77, and the value 24 corresponds to the number of lines of information in the data file prior to data records. Some data files purporting to be MGD77 omit these first 24 lines. In that case, the attribute Nav.HeaderLength should be set to 0.

B.2 Navigation Attribute File for PNSXY Data

```
Nav.Version:              [illegible]

Nav.LatMinimum:           [illegible]
Nav.LonMinimum:           [illegible]
Nav.LatMaximum:           [illegible]
```

```
Nav.lonMaximum:          -46.1

Nav.timeMinimum:         92/08/05 00:00:00
Nav.timeMaximum:         92/08/05 23:59:59

Nav.format:              PNSXY

Nav.location:            List

Nav.utmZone:             23

Nav.numPoints:           4500
Nav.headerLength:        0
^L
/net/test/navigation/file1.pnsxy
/net/test/navigation/file2.pnsxy
/net/test/sample/newFile.xy
[end-of-file]
```

In this example, it is necessary to specify the attribute `Nav.utmZone`, since the postion data is in cartesian X/Y form. Also, note the use of the value associated with the attribute `Nav.location`. When set to `List`, these attributes describe a list of data files, and the names of these data files are appended at the end of the attribute file.

B.3 Alongtrack Attribute File for String Data

```
Atk.version:             v1.0

Atk.latMinimum:          24.0
Atk.lonMinimum:          -47.0
Atk.latMaximum:          25.0
Atk.lonMaximum:          -46.1

Atk.type:                String
Atk.format:              ASCII
Atk.location:            Internal

Atk.numPoints:           5
Atk.headerLength:        0
^L
24.1        -46.2        Dredge Site #1
24.3        -46.9        Dredge Site #2
24.5555 -46.75 Dredge Site #3
24.2  -46.5 Lost Dredge
```

```
24.2  -46.501          Recovered Pinger
[end-of-file]
```

In this example, note the use of the attribute `Atk.location`. When set to `Internal`, then the data records described are appended to the attribute file itself. Note also the format of the data records. There are three values per line (latitude, longitude, and string), separated by white-space (spaces and/or tabs).

B.4 Alongtrack Attribute File for DSL Data

```
Atk.version:           v1.0

Atk.latMinimum:        24.0
Atk.lonMinimum:        -75.0
Atk.latMaximum:        25.0
Atk.lonMaximum:        -74.0

Atk.type:              Value
Atk.valueMinimum:      0.0
Atk.valueMaximum:      1000.0
Atk.valueName:         Widgets
Atk.valueUnits:        w

Atk.format:            DSL
Atk.record:            2

Atk.location:          External
Atk.fileName:          siteB.wdgts
Atk.filePath:          /data

Atk.numPoints:         1440
Atk.headerLength:      0
^L
[end-of-file]
```

In this example, note the use of the attribute `Atk.record`. When set to `2`, this denotes the use of the second *value column* from the DSL-format file. For this format, there are presently eight fixed columns of data. Value columns begin *after* these columns — hence, the second value record is the tenth overall column of data.

B.5 Grid Attribute File

```
Grd.version:           DD_GRD_1.0
Grd.creator:           sfc2grd V1.0
```

```
Grd.creationTime:        Aug 17 1992 05:15:01
Grd.name:                SRP Interpolated Bathymetry
Grd.source:              Foobar
Grd.sourceTime:          Aug 15 1992 15:58:01
Grd.comments:            Gridded Masked Interpolated Bathymetry
Grd.unit:                meter
Grd.precision:           6
Grd.minimumValue:        1500.000000
Grd.maximumValue:        5000.000000
Grd.nullValue:           0.0
Grd.projectionType:      UTM
Grd.projectionEllipsoid: WGS-84
Grd.projectionUTMZone:   23
Grd.coordinateUnit:      meter
Grd.coordinateSense:     Right-Hand
Grd.coordinateLattice:   Grid
Grd.xOrigin:             0.000000
Grd.yOrigin:             2800000.000000
Grd.zOrigin:             0.000000
Grd.xScale:              200.000000
Grd.yScale:              200.000000
Grd.zScale:              1.000000
Grd.zRotation:           0.0
Grd.format:              Sun Raster
Grd.screen:              True
Grd.type:                Single
Grd.depth:               32
Grd.dimension:           1
Grd.order:               Row-Major
Grd.xSize:               3000
Grd.ySize:               1250
Grd.headerLength:        800
Grd.location:            External
Grd.fileName:            ew9208.600_250k.0_28000.200m.hy.super.ras
Grd.filePath:            /data/ew9208/hysweep/grid/masked
^L
[end-of-file]
```

Note that many of the attributes described in Section 6.3, Gridded Data, are not present in this sample attribute file. Only those attributes known or needed are required.

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16. Abstract (Limit: 200 words)

MapTool is an interactive computer program for the display of common marine geophysical data. At present, the program displays isolines, color-filled contours, navigation tracklines, and navigated scalar values in a variety of styles. A variety of map projections are supported. This document describes the basic requirements for running the *MapTool* program, for creating various displays, and generating hard copy output. The supported data file formats are described. All of the options, displays, menus, and windows are documented.

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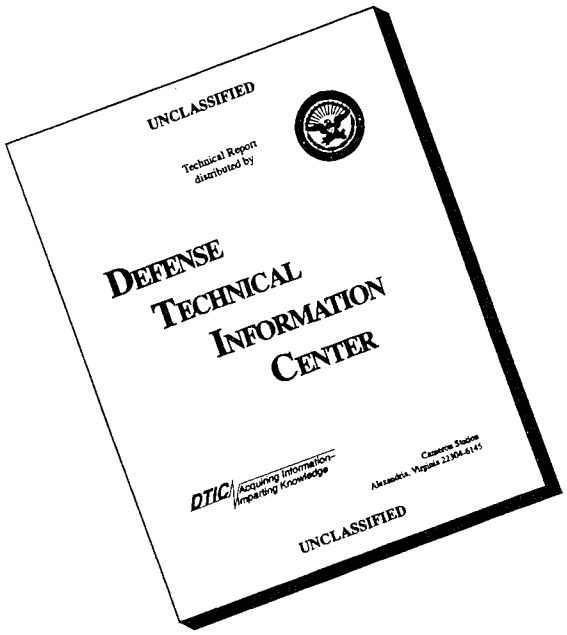

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